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FINANCIAL MANAGEMENT

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CHAPTER – 05

INVESTMENT DECISIONS

(1) BASICS

Question – 01

ABC Ltd is evaluating the purchase of a new machinery with a depreciable base of ₹ 1,00,000; expected economic life of 4 years and change in earnings before taxes and depreciation of ₹ 45,000 in year 1, ₹ 30,000 in year 2, ₹ 25,000 in year 3 and ₹ 35,000 in year 4. Assume straight-line depreciation and a 20% tax rate. You are required to COMPUTE relevant cash flows.

(Study Material ICAI Illus – 01)

Solution:

Depreciation = ₹ 1,00,000 ÷ 4 = ₹ 25,000

Amount in (₹)

	Years			
	1	2	3	4
Earnings before tax and depreciation	45,000	30,000	25,000	35,000
Less: Depreciation	(25,000)	(25,000)	(25,000)	(25,000)
Earnings before tax	20,000	5,000	0	10,000
Less: Tax @20%	(4,000)	(1,000)	0	(2,000)
Earnings after tax	16,000	4,000	0	8,000
Add: Depreciation	25,000	25,000	25,000	25,000
Net Cash flow	41,000	29,000	25,000	33,000

Question – 02

A project requiring an investment of ₹ 10,00,000 and it yields profit after tax and depreciation which is as follows:

Years	Profit after tax and depreciation (₹)
1	50,000
2	75,000
3	1,25,000
4	1,30,000

5	80,000
Total	4,60,000

Suppose further that at the end of the 5th year, the plant and machinery of the project can be sold for ₹ 80,000. DETERMINE Average Rate of Return.

(Study Material ICAI Illus – 02)

Solution:

In this case the rate of return can be calculated as follows:

$$\frac{\text{Total Profit} \div \text{No. of years}}{\text{Average investment/Initial Investment}} \times 100$$

(a) If initial investment is considered then,

$$= \frac{\text{₹ } 4,60,000 \div 5 \text{ years}}{\text{₹ } 10,00,000} \times 100 = \frac{\text{₹ } 92,000}{\text{₹ } 10,00,000} \times 100 = 9.2\%$$

This rate is compared with the rate expected on other projects, had the same funds been invested alternatively in those projects. Sometimes, the management compares this rate with the minimum rate (called-cut off rate). For example, management may decide that they will not undertake any project which has an average annual yield after tax less than 20%. Any capital expenditure proposal which has an average annual yield of less than 20%, will be automatically rejected.

(b) If average investment is considered then,

$$= \frac{\text{₹ } 92,000}{\text{Average Investment}} \times 100 = \frac{\text{₹ } 92,000}{\text{₹ } 50,40,000} \times 100 = 17.04\%$$

Where,

Average Investment

$$= \frac{1}{2} (\text{Initial investment} - \text{Salvage value}) + \text{Salvage value}$$

$$= \frac{1}{2} (\text{₹ } 10,00,000 - \text{₹ } 80,000) + \text{₹ } 80,000$$

$$= \text{₹ } 4,60,000 + \text{₹ } 80,000$$

$$= \text{₹ } 5,40,000$$

Question – 03

COMPUTE the net present value for a project with a net investment of ₹ 1,00,000 and net cash flows for year one is ₹ 55,000; for year two is ₹ 80,000 and for year three is ₹ 15,000. Further, the company's cost of capital is 10%.

[PVIF @ 10% for three years are 0.909, 0.826 and 0.751]

(Study Material ICAI Illus – 03)

Solution:

Year	Net Cash Flows (₹)	PVIF @ 10%	Discounted Cash Flows (₹)
0	(1,00,000)	1.000	(1,00,000)
1	55,000	0.909	49,995
2	80,000	0.826	66,080
3	15,000	0.751	11,265
Net Present Value			27,340

Recommendation: Since the net present value of the project is positive, the company should accept the project.

Question – 04

ABC Ltd. is a small company that is currently analyzing capital expenditure proposals for the purchase of equipment; the company uses the net present value technique to evaluate projects. The capital budget is limited to ₹ 500,000 which ABC Ltd. believes is the maximum capital it can raise. The initial investment and projected net cash flows for each project are shown below. The cost of capital of ABC Ltd is 12%. You are required to COMPUTE the NPV of the different projects.

	Project A (₹)	Project B (₹)	Project C (₹)	Project D (₹)
Initial Investment	200,000	190,000	250,000	210,000
Project Cash Inflows:				
Year 1	50,000	40,000	75,000	75,000
2	50,000	50,000	75,000	75,000
3	50,000	70,000	60,000	60,000
4	50,000	75,000	80,000	40,000
5	50,000	75,000	100,000	20,000

(Study Material ICAI Illus – 04)

Solution:

Calculation of net present value:

Period	PV Factor	Project A (₹)	Project B (₹)	Project C (₹)	Project D (₹)
0	1.000	(2,00,000)	(1,90,000)	(2,50,000)	(2,10,000)
1	0.893	44,650	35,720	66,975	66,975
2	0.797	39,850	39,850	59,775	59,775
3	0.712	35,600	49,840	42,720	42,720
4	0.636	31,800	47,700	50,880	25,440
5	0.567	28,350	42,525	56,700	11,340
Net Present Value		(19,750)	25,635	27,050	(3,750)

Question – 05

Suppose we have three projects involving discounted cash outflow of ₹ 5,50,000, ₹ 75,000 and ₹ 1,00,20,000 respectively. Suppose further that the sum of discounted cash inflows for these projects are ₹ 6,50,000, ₹ 95,000 and ₹ 1,00,30,000 respectively. CALCULATE the desirability factors for the three projects.

(Study Material ICAI Illus – 05)

Solution:

The desirability factors for the three projects would be as follows:

- $$1. = \frac{₹6,50,000}{₹5,50,000} = 1.18$$
- $$2. = \frac{₹95,000}{₹75,000} = 1.27$$
- $$3. = \frac{₹1,00,30,000}{₹1,00,20,000} = 1.001$$

It can be seen that in absolute terms, project 3 gives the highest cash inflows yet its desirability factor is low. This is because the outflow is also very high. The **Desirability/ Profitability Index factor helps us in ranking various projects.**

Since PI is an extension of NPV, it has same advantages and limitation.

Question – 06

A Ltd. is evaluating a project involving an outlay of ₹ 10,00,000 resulting in an annual cash inflow of ₹ 2,50,000 for 6 years. Assuming salvage value of the project is zero; DETERMINE the IRR of the project.

(Study Material ICAI Illus – 06)

Solution:

First of all, we shall find an approximation of the payback period:

$$= \frac{10,00,000}{2,50,000} = 4$$

Now, we shall search this figure in the PVAF table corresponding to 6-year row.

The value 4 lies between values 4.111 and 3.998, correspondingly discounting rates are 12% and 13% respectively

NPV @ 12% and 13% is:

$$\text{NPV}_{12\%} = (10,00,000) + 4.111 \times 2,50,000 = +27,750$$

$$\text{NPV}_{13\%} = (10,00,000) + 3.998 \times 2,50,000 = -500$$

The internal rate of return is, thus, more than 12% but less than 13%. The exact rate can be obtained by interpolation:

$$\text{IRR} = 12\% + \frac{27,750}{2,50,000 - (-500)} \times (13\% - 12\%)$$

$$= 12\% + \frac{27,750}{28,250} = 12.978\%$$

$$\text{IRR} = 12.978\%$$

Question – 07

CALCULATE the internal rate of return of an investment of ₹ 1,36,000 which yields the following cash inflows:

Year	Cash Inflows (₹)
1	30,000
2	40,000
3	60,000

4	30,000
5	20,000

(Study Material ICAI Illus – 07)

Solution:

Let us discount cash flows by 10%.

Year	Cash Inflows (₹)	Discounting Factor at 10%	Present Value (₹)
1	30,000	0.909	27,270
2	40,000	0.826	33,040
3	60,000	0.751	45,060
4	30,000	0.683	20,490
5	20,000	0.621	12,420
Total present value			1,38,280
Less: Initial Investment			1,36,000
NPV			+2,280

The NPV calculated @ 10% is positive. Therefore, a higher discount rate is suggested, say, 12%.

Year	Cash Inflows (₹)	Discounting Factor at 12%	Present Value (₹)
1	30,000	0.893	26,790
2	40,000	0.797	31,880
3	60,000	0.712	42,720
4	30,000	0.636	19,080
5	20,000	0.567	11,340
Total present value			1,31,810
Less: Initial Investment			1,36,000
NPV			- 4,190

The internal rate of return is, thus, more than 10% but less than 12%. The exact rate can be obtained by interpolation:

$$\begin{aligned}
 \text{IRR} &= \text{LR} + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} \times (\text{HR} - \text{LR}\%) \\
 &= 10 + \frac{₹ 2,280}{₹ 2,280 - (-4,190)} \times (12 - 10)
 \end{aligned}$$

$$= 10 + \frac{₹ 2,280}{₹ 6,470} \times (12 - 10) = 10 + 0.704$$

IRR = 10.704%.

Question – 08

A company proposes to install machine involving a capital cost of ₹ 3,60,000. The life of the machine is 5 years and its salvage value at the end of the life is nil. The machine will produce the net operating income after depreciation of ₹ 68,000 per annum. The company's tax rate is 45%.

The Net Present Value factors for 5 years are as under:

Discounting Rate	14	15	16	17	18
Cumulative Factor	3.43	3.35	3.27	3.20	3.13

You are required to COMPUTE the internal rate of return of the proposal.

(Study Material ICAI Illus – 08)

Solution:

Computation of Cash inflow per annum

Particulars	(₹)
Net operating income per annum	68,000
Less: Tax @ 45%	(30,600)
Profit after tax	37,400
Add: Depreciation (₹ 3,60,000 / 5 years)	72,000
Cash inflow	1,09,400

The IRR of the investment can be found as follows:

$$NPV = - ₹ 3,60,000 + ₹ 1,09,400 (PVAF_5, r) = 0$$

$$\text{or } PVAF_{5,r} (\text{Cumulative factor}) = \frac{₹ 3,60,000}{₹ 1,09,400} = 3.29$$

As 3.29 falls between Discounted rate 15 & 16, the computation is as below :

Computation of Internal Rate of Return

	Discounting Rate	
	15%	16%
Cumulative factor	3.35	3.27

PV of Inflows (₹)	3,66,490 (₹ 1,09,400 × 3.35)	3,57,738 (₹ 1,09,400 × 3.27)
Less: Initial outlay (₹)	3,60,000	3,60,000
NPV (₹)	6,490	(2,262)

$$\text{IRR} = 15 + \left[\frac{6,490}{6,490 + 2,262} \right] \times (16 - 15) = 15 + 0.74 = 15.74\%$$

Question – 09

An investment of ₹ 1,36,000 yields the following cash inflows (profits before depreciation but after tax). DETERMINE MIRR considering 8% as cost of capital.

Year	(₹)
1	30,000
2	40,000
3	60,000
4	30,000
5	20,000
	1,80,000

(Study Material ICAI Illus – 09)

Solution:

Year 0 – Cash outflow = ₹ 1,36,000

The MIRR is calculated on the basis of investing the inflows at the cost of capital. The table below shows the value of the inflows, if they are immediately reinvested at 8%.

Year	Cash Flow	@ 8% Reinvestment Rate Factor	(₹)
1	30,000	1.3605*	40,815
2	40,000	1.2597	50,388
3	60,000	1.1664	69,984
4	30,000	1.0800	32,400
5	20,000	1.0000	20,000
			2,13,587

* Investment of ₹ 1 at the end of the year 1 is reinvested for 4 years (at the end of 5 years) shall become $1(1.08)^4 = 1.3605$. Similarly, reinvestment rate factor

for remaining years shall be calculated. Please note that the investment at the end of 5th year shall be reinvested for zero year, hence, reinvestment rate factor shall be 1.

The total cash outflow in year 0 (₹ 1,36,000) is compared with the possible inflow at year 5 and the resulting figure = $\frac{1,36,000}{2,13,587} = 0.6367$ is the discount factor in year 5. By looking at the year 5 row in the present value tables, you will see that this gives a return of 9%. This means that the ₹ 2,13,587 received in year 5 is equivalent to ₹ 1,36,000 in year 0 if the discount rate is 9%. Alternatively, we can compute MIRR as follows:

$$\text{Total return} = \frac{2,13,587}{1,36,000} = 1.5705$$

$$\text{MIRR} = \sqrt[5]{1.5705} - 1 = 9\%.$$

Question – 10

Suppose there are two Project A and Project B are under consideration. The cash flows associated with these projects are as follows:

Year	Project A (₹)	Project B (₹)
0	(1,00,000)	(3,00,000)
1	50,000	1,40,000
2	60,000	1,90,000
3	40,000	1,00,000

Assuming Cost of Capital equal to 10%, IDENTIFY which project should be accepted as per NPV Method and IRR Method.

(Study Material ICAI Illus – 10)

Solution:

Net Present Value (NPV) of Projects

Year	Cash Inflows of Project A (₹)	Cash Inflows of Project B (₹)	Present Value Factor @ 10%	PV of Project A (₹)	PV of Project B (₹)
0	(1,00,000)	(3,00,000)	1.000	(1,00,000)	(3,00,000)
1	50,000	1,40,000	0.909	45,450	1,27,260

2	60,000	1,90,000	0.826	49,560	1,56,940
3	40,000	1,00,000	0.751	30,040	75,100
NPV				25,050	59,300

Internal Rate of Returns (IRR) of projects

Since by discounting cash flows at 10%, we are getting values very far from zero. Therefore, let us discount cash flows using 20% discounting rate.

Year	Cash Inflows of Project A (₹)	Cash Inflows of Project B (₹)	Present Value Factor @ 20%	PV of Project A (₹)	PV of Project B (₹)
0	(1,00,000)	(3,00,000)	1.000	(1,00,000)	(3,00,000)
1	50,000	1,40,000	0.833	41,650	1,16,620
2	60,000	1,90,000	0.694	41,640	1,31,860
3	40,000	1,00,000	0.579	23,160	57,900
NPV				6,450	6,380

Even by discounting cash flows at 20%, we are getting values far from zero. Therefore, let us discount cash flows using 25% discounting rate.

Year	Cash Inflows of Project A (₹)	Cash Inflows of Project B (₹)	Present Value Factor @ 25%	PV of Project A (₹)	PV of Project B (₹)
0	(1,00,000)	(3,00,000)	1.000	(1,00,000)	(3,00,000)
1	50,000	1,40,000	0.800	40,000	1,12,000
2	60,000	1,90,000	0.640	38,400	1,21,600
3	40,000	1,00,000	0.512	20,480	51,200
NPV				(1,120)	(15,200)

The internal rate of return is, thus, more than 20% but less than 25%. The exact rate can be obtained by interpolation:

$$\begin{aligned} \text{IRR}_A &= 20\% + \frac{6,450}{6,450 - (1,120)} \times (25\% - 20\%) \\ &= 20\% + \left(\frac{6,450}{7,570} \times 5\% \right) = 24.26\% \end{aligned}$$

$$\text{IRR}_B = 20\% + \frac{6,380}{6,380 - (15,200)} \times (25\% - 20\%)$$

$$= 20\% + \left(\frac{6,380}{21,580} \times 5\% \right) = 21.48\%$$

Overall Position

	Project A	Project B
NPV @ 10%	₹ 25,050	₹ 59,300
IRR	24.26%	21.48%

Thus, there is contradiction in ranking by two methods.

Question – 11

Suppose ABC Ltd. is considering two Project X and Project Y for investment. The cash flows associated with these projects are as follows:

Year	Project X (₹)	Project Y (₹)
0	(2,50,000)	(3,00,000)
1	2,00,000	50,000
2	1,00,000	1,00,000
3	50,000	3,00,000

Assuming Cost of Capital be 10%, IDENTIFY which project should be accepted as per NPV Method and IRR Method.

(Study Material ICAI Illus – 11)

Solution:

Net Present Value of Projects

Year	Cash Inflows of Project X (₹)	Cash Inflows of Project Y (₹)	Present Value Factor @ 10%	PV of Project X (₹)	PV of Project Y (₹)
0	(2,50,000)	(3,00,000)	1.000	(2,50,000)	(3,00,000)
1	2,00,000	50,000	0.909	1,81,800	45,450
2	1,00,000	1,00,000	0.826	82,600	82,600
3	50,000	3,00,000	0.751	37,550	2,25,300
NPV				51,950	53,350

Internal Rate of Returns of projects

Since, by discounting cash flows at 10%, we are getting values far from zero. Therefore, let us discount cash flows using 20% discounting rate.

Year	Cash Inflows of Project X (₹)	Cash Inflows of Project Y (₹)	Present Value Factor @ 20%	PV of Project X (₹)	PV of Project Y (₹)
0	(2,50,000)	(3,00,000)	1.000	(2,50,000)	(3,00,000)
1	2,00,000	50,000	0.833	1,66,600	41,650
2	1,00,000	1,00,000	0.694	69,400	69,400
3	50,000	3,00,000	0.579	28,950	1,73,700
NPV				14,950	(15,250)

Since, by discounting cash flows at 20% we are getting that value of Project X is positive and value of Project Y is negative. Therefore, let us discount cash flows of Project X using 25% discounting rate and Project Y using discount rate of 15%.

Year	Cash Inflows of Project X (₹)	Present Value Factor @ 25%	PV of Project X (₹)	Cash Inflows of Project Y (₹)	Present Value Factor @ 15%	PV of Project Y (₹)
0	(2,50,000)	1.000	(2,50,000)	(3,00,000)	1.000	(3,00,000)
1	2,00,000	0.800	1,60,000	50,000	0.870	43,500
2	1,00,000	0.640	64,000	1,00,000	0.756	75,600
3	50,000	0.512	25,600	3,00,000	0.658	1,97,400
NPV			(400)			16,500

The internal rate can be obtained by interpolation:

$$IRR_X = 20\% + \frac{14,950}{14,950 - (400)} \times (25\% - 20\%)$$

$$= 20\% + \left(\frac{14,950}{15,350} \times 5\% \right) = 24.87\%$$

$$IRR_Y = 15\% + \frac{16,500}{16,500 - (15,520)} \times (20\% - 15\%)$$

$$= 15\% + \left(\frac{16,500}{31,750} \times 5\% \right) = 17.60\%$$

Overall Position

	Project A	Project B
NPV @ 10%	₹ 51,590	₹ 53,350

IRR	24.87%	17.60%
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Thus, there is contradiction in ranking by two methods.

Question – 12

Suppose MVA Ltd. is considering two Project A and Project B for investment. The cash flows associated with these projects are as follows:

Year	Project A (₹)	Project B (₹)
0	(5,00,000)	(5,00,000)
1	7,50,000	2,00,000
2	0	2,00,000
3	0	7,00,000

Assuming Cost of Capital equal to 12%, ANALYSE which project should be accepted as per NPV Method and IRR Method?

(Study Material ICAI Illus – 12)

Solution:

Net Present Value of Projects

Year	Cash Inflows of Project A (₹)	Cash Inflows of Project B (₹)	Present Value Factor @ 12%	PV of Project A (₹)	PV of Project B (₹)
0	(5,00,000)	(5,00,000)	1.000	(5,00,000)	(5,00,000)
1	7,50,000	2,00,000	0.893	6,69,750	1,78,600
2	0	2,00,000	0.797	0	1,59,400
3	0	7,00,000	0.712	0	4,98,400
NPV				1,69,750	3,36,400

Internal Rate of Returns of projects

Let us discount cash flows using 50% discounting rate.

Year	Cash Inflows of Project A (₹)	Cash Inflows of Project B (₹)	Present Value Factor @ 50%	PV of Project A (₹)	PV of Project B (₹)
0	(5,00,000)	(5,00,000)	1.000	(5,00,000)	(5,00,000)
1	7,50,000	2,00,000	0.667	5,00,250	1,33,400

2	0	2,00,000	0.444	0	88,800
3	0	7,00,000	0.296	0	2,07,200
NPV				250	(70,600)

Since, IRR of project A shall be 50% as NPV is very small. Further, by discounting cash flows at 50%, we are getting NPV of Project B negative. Therefore, let us discount cash flows of Project B using 15% discounting rate.

Year	Cash Inflows of Project B (₹)	Present Value Factor @ 15%	PV of Project B (₹)
0	(5,00,000)	1.000	(5,00,000)
1	2,00,000	0.870	1,74,000
2	2,00,000	0.756	1,51,200
3	7,00,000	0.658	4,60,600
NPV			2,85,800

The internal rate can be obtained by interpolation:

$$\begin{aligned} \text{IRR}_B &= 15\% + \frac{2,85,800}{2,85,800 - (70,600)} \times (50\% - 15\%) \\ &= 15\% + \left(\frac{2,85,800}{3,56,400} \times 35\% \right) = 43.07\% \end{aligned}$$

Overall Position

	Project A	Project B
NPV @ 12%	₹ 1,69,750	₹ 3,36,400
IRR	50.00%	43.07%

Thus, there is contradiction in ranking by two methods.

Question – 13

Shiva Limited is planning its capital investment programme for next year. It has five projects all of which give a positive NPV at the company cut-off rate of 15 percent, the investment outflows and present values being as follows:

Project	Investment (₹)	NPV @ 15% (₹)
A	(50,000)	15,400
B	(40,000)	18,700
C	(25,000)	10,100
D	(30,000)	11,200
E	(35,000)	19,300

The company is limited to a capital spending of ₹ 1,20,000.

You are required to ILLUSTRATE the returns from a package of projects within the capital spending limit. The projects are independent of each other and are divisible (i.e., part project is possible).

(Study Material ICAI Illus – 13)

Solution:

Computation of NPVs per ₹ 1 of Investment and Ranking of the Projects

Project	Investment	NPV @ 15%	NPV per ₹ 1 invested	Ranking
	₹ '000	₹ '000		
A	(50)	15.4	0.31	5
B	(40)	18.7	0.47	2
C	(25)	10.1	0.40	3
D	(30)	11.2	0.37	4
E	(35)	19.3	0.55	1

Building up of a Programme of Projects based on their Rankings

Project	Investment	NPV @ 15%
	₹ '000	₹ '000
E	(35)	19.3
B	(40)	18.7
C	(25)	10.1
D	(20)	7.5
	120	55.6

Thus, Project A should be rejected and only two-third of Project D be undertaken. If the projects are not divisible then other combinations can be examined as:

	Investment	NPV @ 15%
	₹ '000	₹ '000
E + B + C	100	48.1
E + B + D	105	49.2

In this case E + B + D would be preferable as it provides a higher NPV despite D ranking lower than C.

Question – 14

R Pvt. Ltd. is considering modernizing its production facilities and it has two proposals under consideration. The expected cash flows associated with these projects and their NPV as per discounting rate of 12% and IRR is as follows:

Year	Cash Flow	
	Project A (₹)	Project B (₹)
0	(40,00,000)	(20,00,000)
1	8,00,000	7,00,000
2	14,00,000	13,00,000
3	13,00,000	12,00,000
4	12,00,000	0
5	11,00,000	0
6	10,00,000	0
NPV @ 12%	6,49,094	5,15,488
IRR	17.47%	25.20%

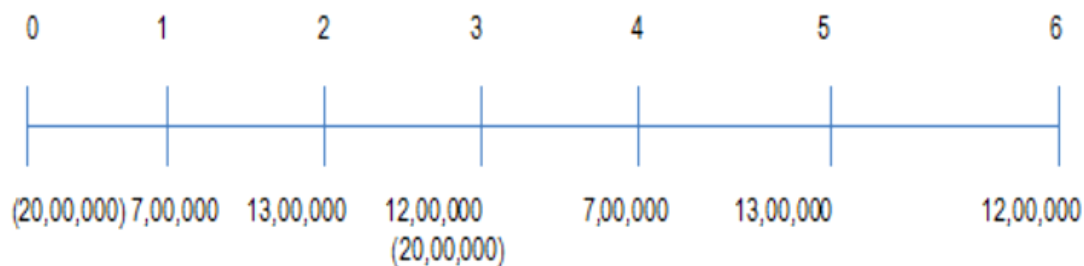
IDENTIFY which project should R Pvt. Ltd. accept?

(Study Material ICAI Illus – 14)

Solution:

Although from NPV point of view, Project A appears to be better but from IRR point of view, Project B appears to be better. Since, both projects have unequal lives, selection on the basis of these two methods shall not be proper. In such situation, we shall use any of the following method:

- (i) **Replacement Chain (Common Life) Method:** Since the life of the Project A is 6 years and Project B is 3 years, to equalize lives, we can have second opportunity of investing in project B after one time investing. The position of cash flows in such situation shall be as follows:



NPV of extended life of 6 years of Project B shall be ₹ 8,82,403 and IRR of 25.20%. Accordingly, with extended life NPV of Project B it appears to be more attractive.

(ii) Equivalent Annualized Criterion: The method discussed above has one drawback when we have to compare two projects with one has a life of 3 years and other has 5 years. In such case, the above method shall require analysis of a period of 15 years i.e. common multiple of these two values. The simple solution to this problem is use of Equivalent Annualized Criterion involving following steps:

- Compute NPV using the WACC or discounting rate.
- Compute Present Value Annuity Factor (PVAF) of discounting factor used above for the period of each project.
- Divide NPV computed under step (a) by PVAF as computed under step (b) and compare the values.

Accordingly, for proposal under consideration:

	Project A	Project B
NPV @ 12%	₹ 6,49,094	₹ 5,15,488
PVAF @12%	4.112	2.402
Equivalent Annualized Criterion	₹ 1,57,854	₹ 2,14,608

Thus, Project B should be selected.

Question – 15

Alpha Company is considering the following investment projects:

Projects	Cash Flows (₹)			
	C ₀	C ₁	C ₂	C ₃
A	-10,000	+10,000		
B	-10,000	+7,500	+7,500	
C	-10,000	+2,000	+4,000	+12,000
D	-10,000	+10,000	+3,000	+3,000

- ANALYSE and rank the projects according to each of the following methods: (i) Payback, (ii) ARR, (iii) IRR and (iv) NPV, assuming discount rates of 10 and 30 per cent.

- (b) Assuming the projects are independent, which one should be accepted? If the projects are mutually exclusive, IDENTIFY which project is the best?

(Study Material ICAI Illus – 15)

Solution:

(a) (i) Payback Period

$$\text{Project A: ₹ 10,000/₹ 10,000} = 1 \text{ year}$$

$$\text{Project B: ₹ 10,000/₹ 7,500} = 1 \frac{1}{3} \text{ years}$$

$$\text{Project C: 2 years} + \frac{\text{₹ 10,000} - \text{₹ 6,000}}{\text{₹ 12,000}} = 2 \frac{1}{3} \text{ years}$$

$$\text{Project D: 1 year}$$

(ii) ARR (Figures in ₹)

$$\text{Project A: } \frac{(10,000 - 10,000)1/2}{(10,000)1/2} = 0$$

$$\text{Project B: } \frac{(15,000 - 10,000)1/2}{(10,000)1/2} = \frac{2,500}{5,000} = 50\%$$

$$\text{Project C: } \frac{(18,000 - 10,000)1/3}{(10,000)1/2} = \frac{2,667}{5,000} = 53\%$$

$$\text{Project D: } \frac{(16,000 - 10,000)1/3}{(10,000)1/2} = \frac{2,000}{5,000} = 40\%$$

Note: This net cash proceed includes recovery of investment also. Therefore, net cash earnings are found by deducting initial investment.

(iii) IRR

Project A:	The net cash proceeds in year 1 are just equal to investment. Therefore, $r = 0\%$.
------------	--

Project B:	This project produces an annuity of ₹ 7,500 for two years. Therefore, the required PVAF is: ₹ 10,000/₹ 7,500 = 1.33. This factor is found under 32% column. Therefore, $r = 32\%$
Project C:	Since cash flows are uneven, the trial and error method will be followed. Using 20% rate of discount, the NPV is + ₹ 1,389. At 30% rate of discount, the NPV is – ₹ 633. The true rate of return should be less than 30%. At 27% rate of discount, it is found that the NPV is – ₹ 86 and + ₹ 105 at 26%. Through interpolation, we find $r = 26.5\%$
Project D:	In this case also by using the trial and error method, it is found that at 37.6% rate of discount, NPV becomes almost zero. Therefore, $r = 37.6\%$.

(iv) NPV

Project A:

$$\text{at } 10\% \quad -10,000 + 10,000 \times 0.909 = -910$$

$$\text{at } 30\% \quad -10,000 + 10,000 \times 0.769 = -2,310$$

Project B:

$$\text{at } 10\% \quad -10,000 + 7,500(0.909 + 0.826) = +3,013$$

$$\text{at } 30\% \quad -10,000 + 7,500(0.769 + 0.592) = +208$$

Project C:

$$\begin{aligned} \text{at } 10\% \quad & -10,000 + 2,000 \times 0.909 + 4,000 \times 0.826 + 12,000 \times 0.751 \\ & = +4,134 \end{aligned}$$

$$\begin{aligned} \text{at } 30\% \quad & -10,000 + 2,000 \times 0.769 + 4,000 \times 0.592 + 12,000 \times 0.455 \\ & = -633 \end{aligned}$$

Project D:

$$\begin{aligned} \text{at } 10\% \quad & -10,000 + 10,000 \times 0.909 + 3,000 \times (0.826 + 0.751) \\ & = +3,821 \end{aligned}$$

$$\begin{aligned} \text{at 30\%} \quad & -10,000 + 10,000 \times 0.769 + 3,000 \times (0.592 + 0.455) \\ & = + 831 \end{aligned}$$

The projects are ranked as follows according to the various methods:

Projects	PBP	ARR	IRR	NPV (10%)	NPV (30%)
A	1	4	4	4	4
B	2	2	2	3	2
C	3	1	3	1	3
D	1	3	1	2	1

- (b) Payback and ARR are theoretically unsound method for choosing between the investment projects. Between the two time-adjusted (DCF) investment criteria, NPV and IRR, NPV gives consistent results. If the projects are independent (and there is no capital rationing), either IRR or NPV can be used since the same set of projects will be accepted by any of the methods. In the present case, except Project A all the three projects should be accepted if the discount rate is 10%. Only Projects B and D should be undertaken if the discount rate is 30%.

If it is assumed that the projects are mutually exclusive, then under the assumption of 30% discount rate, the choice is between B and D (A and C are unprofitable). Both criteria IRR and NPV give the same results – D is the best. Under the assumption of 10% discount rate, ranking according to IRR and NPV conflict (except for Project A). If the IRR rule is followed, Project D should be accepted. But the NPV rule tells that Project C is the best. The NPV rule generally gives consistent results in conformity with the wealth maximization principle. Therefore, Project C should be accepted following the NPV rule.

Question – 16

The expected cash flows of three projects are given below. The cost of capital is 10 per cent.

- (a) CALCULATE the payback period, net present value, internal rate of return and accounting rate of return of each project.
- (b) IDENTIFY the rankings of the projects by each of the four methods.

(₹ in '000)

Period	Project A (₹)	Project B (₹)	Project (₹)
--------	---------------	---------------	-------------

0	(5,000)	(5,000)	(5,000)
1	900	700	2,000
2	900	800	2,000
3	900	900	2,000
4	900	1,000	1,000
5	900	1,100	
6	900	1,200	
7	900	1,300	
8	900	1,400	
9	900	1,500	
10	900	1,600	

(Study Material ICAI Illus – 16)

Solution:**(a) Payback Period Method:**

$$A = 5 + (500/900) = 5.56 \text{ years}$$

$$B = 5 + (500/1,200) = 5.42 \text{ years}$$

$$C = 2 + (1,000/2,000) = 2.5 \text{ years}$$

Net Present Value Method:

$$NPV_A = (-5,000) + (900 \times 6.145) = (5,000) + 5,530.5 = ₹ 530.5$$

NPV_B is calculated as follows:

Year	Cash Flow (₹)	10% Discount Factor	Present Value (₹)
0	(5000)	1.000	(5,000)
1	700	0.909	636
2	800	0.826	661
3	900	0.751	676
4	1000	0.683	683
5	1100	0.621	683
6	1200	0.564	677
7	1300	0.513	667
8	1400	0.467	654
9	1500	0.424	636
10	1600	0.386	618
			1591

NPVC is calculated as follows:

Year	Cash Flow (₹)	10% Discount Factor	Present Value (₹)
0	(5000)	1.000	(5,000)
1	2000	0.909	1818
2	2000	0.826	1652
3	2000	0.751	1502
4	1000	0.683	683
			655

Internal Rate of Return

Project A

$$\text{NPV at 12\%} = (5,000) + 900 \times 5.650$$

$$= (5,000) + 5085 = 85$$

$$\text{NPV at 13\%} = (5,000) + 900 \times 5.426$$

$$= (5,000) + 4,883.40 = -116.60$$

$$\text{IRR}_A = 12 + \left[\frac{85}{85+116.60} \right] \times (13 - 12) = 12 + 0.42$$

$$= 12.42\%$$

Project B

IRR_B

Year	Cash Flow (₹)	10% Discount Factor	Present Value (₹)	16% Discount Factor	Present Value (₹)
0	(5,000)	1.000	(5,000)	1.000	(5,000)
1	700	0.909	636	0.862	603
2	800	0.826	661	0.743	595
3	900	0.751	676	0.641	577
4	1,000	0.683	683	0.552	552
5	1,100	0.621	683	0.476	524
6	1,200	0.564	677	0.410	493
7	1,300	0.513	667	0.354	460
8	1,400	0.467	654	0.305	427

9	1,500	0.424	636	0.263	394
10	1,600	0.386	618	0.227	363
			1,591		(12)

$$\begin{aligned}\text{Interpolating: IRR}_B &= 10\% + \frac{1,591}{(1,591+12)} \times (16\% - 10\%) \\ &= 10\% + 5.94\% = 15.94\%\end{aligned}$$

Project C

IRR_C

Year	Cash Flow (₹)	15% Discount Factor	Present Value (₹)	18% Discount Factor	Present Value (₹)
0	(5,000)	1.000	(5,000)	1.000	(5,000)
1	2,000	0.870	1,740	0.847	1,694
2	2,000	0.756	1,512	0.718	1,436
3	2,000	0.658	1,316	0.609	1,218
4	1,000	0.572	572	0.516	516
			140		(136)

$$\begin{aligned}\text{Interpolating: IRR}_C &= 15\% + \frac{140}{(140+136)} \times (18\% - 15\%) \\ &= 15\% + 1.52\% = 16.52\%\end{aligned}$$

Accounting Rate of Return:

$$\text{ARR}_A: \text{Average capital employed} = \frac{5,000}{2} = ₹ 2,500$$

$$\text{Average accounting profit} = \frac{(9,000 - 5,000)}{10} = ₹ 400$$

$$\text{ARR}_A = \frac{(4,000 \times 100)}{2,500} = 16 \text{ per cent}$$

$$\text{ARR}_B: \text{Average accounting profit} = \frac{(11,500 - 5,000)}{10} = ₹ 650$$

$$ARR_B = \frac{(650 \times 100)}{2,500} = 26 \text{ per cent}$$

$$ARR_C: \text{Average accounting profit} = \frac{(7,000 - 5,000)}{4} = ₹ 500$$

$$ARR_C = \frac{(500 \times 100)}{2,500} = 20 \text{ per cent}$$

(b) Summary of Results

	A	B	C
Payback (years)	5.5	5.4	2.5
NPV (₹)	530.50	1,591	655
IRR (%)	12.42	15.94	16.52
ARR (%)	16	26	20

Comparison of Rankings

Method	Payback	NPV	IRR	ARR
1	C	B	C	B
2	B	C	B	C
3	A	A	A	A

Question – 17

X Limited is considering purchasing of new plant worth ₹ 80,00,000. The expected net cash flows after taxes and before depreciation are as follows:

Year	Net Cash Flows (₹)
1	14,00,000
2	14,00,000
3	14,00,000
4	14,00,000
5	14,00,000
6	16,00,000
7	20,00,000
8	30,00,000
9	20,00,000
10	8,00,000

The rate of cost of capital is 10%.

You are required to CALCULATE:

- (i) Pay-back period
- (ii) Net present value at 10 discount factor
- (iii) Profitability index at 10 discount factor
- (iv) Internal rate of return with the help of 10% and 15% discount factor

The following present value table is given for you:

Year	Present value of ₹ 1 at 10% discount rate	Present value of ₹ 1 at 15% discount rate
1	0.909	0.87
2	0.826	0.756
3	0.751	0.658
4	0.683	0.572
5	0.621	0.497
6	0.564	0.432
7	0.513	0.376
8	0.467	0.327
9	0.424	0.284
10	0.386	0.247

(Study Material ICAI Illus – 17)

Solution:

(i) Calculation of Pay-back Period

Cash Outlay of the Project = ₹ 80,00,000

Total Cash Inflow for the first five years = ₹ 70,00,000

Balance of cash outlay left to be paid back in the 6th year = ₹ 10,00,000

Cash inflow for 6th year = ₹ 16,00,000

So, the payback period is between 5th and 6th years, i.e.,

$$5 \text{ years} + \frac{₹ 10,00,000}{₹ 16,00,000} = 5.625 \text{ years or } 5 \text{ years } 7.5 \text{ months}$$

(ii) Calculation of Net Present Value (NPV) @10% discount rate:

Year	Net Cash Inflow (₹)	Present Value at Discount Rate of 10%	Present Value (₹)
	(a)	(b)	(c) = (a) × (b)
1	14,00,000	0.909	12,72,600
2	14,00,000	0.826	11,56,400
3	14,00,000	0.751	10,51,400
4	14,00,000	0.683	9,56,200
5	14,00,000	0.621	8,69,400
6	16,00,000	0.564	9,02,400
7	20,00,000	0.513	10,26,000
8	30,00,000	0.467	14,01,000
9	20,00,000	0.424	8,48,000
10	8,00,000	0.386	3,08,800
			97,92,200

Net Present Value (NPV)

= Cash Outflow – Present Value of Cash Inflows

= ₹ 80,00,000 – ₹ 97,92,200 = 17,92,200

(iii) Calculation of Profitability Index @ 10% discount rate:

Profitability Index = $\frac{\text{Present Value of Cash Inflows}}{\text{Cost of the Investment}}$

$$= \frac{₹ 97,92,200}{₹ 80,00,000} = 1.224$$

(iv) Calculation of Internal Rate of Return:

Net present value @ 10% interest rate factor has already been calculated in (ii) above, we will calculate Net present value @15% rate factor.

Year	Net Cash Inflow (₹)	Present Value at Discount Rate of 15%	Present Value (₹)
	(a)	(b)	(c) = (a) × (b)
1	14,00,000	0.870	12,18,000
2	14,00,000	0.756	10,58,400
3	14,00,000	0.658	9,21,200
4	14,00,000	0.572	8,00,800

5	14,00,000	0.497	6,95,800
6	16,00,000	0.432	6,91,200
7	20,00,000	0.376	7,52,000
8	30,00,000	0.327	9,81,000
9	20,00,000	0.284	5,68,000
10	8,00,000	0.247	1,97,600
			78,84,000

Net Present Value at 15% = ₹ 78,84,000 – ₹ 80,00,000 = ₹ -1,16,000

As the net present value @ 15% discount rate is negative, hence internal rate of return falls in between 10% and 15%. The correct internal rate of return can be calculated as follows:

$$\begin{aligned}
 \text{IRR} &= L + \frac{\text{NPV}_L}{\text{NPV}_L - \text{NPV}_H} (H - L) \\
 &= 10\% + \frac{₹17,92,200}{₹17,92,200 - (-₹1,16,000)} (15\% - 10\%) \\
 &= 10\% + \frac{₹17,92,200}{₹19,08,200} \times 5\% = 14.7\%
 \end{aligned}$$

Question – 18

Following data has been available for a capital project:

Annual cash inflows ₹ 1,00,000

Useful life 4 years

Salvage value 0

Internal rate of return 12%

Profitability index 1.064

You are required to CALCULATE the following for this project:

- (i) Cost of project
- (ii) Cost of capital
- (iii) Net present value

(iv) Payback period

PV factors at different rates are given below:

Discount factor	12%	11%	10%	9%
1 year	0.893	0.901	0.909	0.917
2 year	0.797	0.812	0.826	0.842
3 year	0.712	0.731	0.751	0.772
4 year	0.636	0.659	0.683	0.708

(Study Material ICAI TYK – 01)

Solution:

(i) Cost of the Project

At 12% internal rate of return (IRR), the sum of total cash inflows = cost of the project i.e initial cash outlay

Annual cash inflows = ₹ 1,00,000

Useful life = 4 years

Considering the discount factor table @ 12%, cumulative present value of cash inflows for 4 years is 3.038 (0.893 + 0.797 + 0.712 + 0.636).

Hence, Total Cash inflows for 4 years for the Project is:

₹ 1,00,000 × 3.038 = ₹ 3,03,800

Hence, Cost of the Project = ₹ 3,03,800

(ii) Cost of Capital

Profitability Index = $\frac{\text{Sum of Discounted Cash Inflows}}{\text{Cost of the Project}}$

1.064 = $\frac{\text{Sum of Discounted Cash Inflows}}{\text{₹ 3,03,800}}$

∴ Sum of Discounted Cash inflows = ₹ 3,23,243.20

Since, Annual Cash Inflows = ₹ 1,00,000

Hence, cumulative discount factor for 4 years = $\frac{₹ 3,23,243.20}{₹ 1,00,000} = 3.232$

From the discount factor table, at discount rate of 9%, the cumulative discount factor for 4 years is 3.239 (0.917 + 0.842 + 0.772 + 0.708).

Hence, Cost of Capital = 9% (approx.)

(iii) Net Present Value (NPV)

NPV = Sum of Present Values of Cash inflows – Cost of the Project
 = ₹ 3,23,243.20 – ₹ 3,03,800 = ₹ 19,443.20

(iv) Payback Period

Payback Period = $\frac{\text{Cost of the Project}}{\text{Annual Cash Inflows}} = \frac{₹ 3,03,800}{₹ 1,00,000} = 3.038 \text{ years}$

Question – 19

Hindlever Company is considering a new product line to supplement its range of products. It is anticipated that the new product line will involve cash investments of ₹ 7,00,000 at time 0 and ₹ 10,00,000 in year 1. After-tax cash inflows of ₹ 2,50,000 are expected in year 2, ₹ 3,00,000 in year 3, ₹ 3,50,000 in year 4 and ₹ 4,00,000 each year thereafter through year 10. Although the product line might be viable even after year 10, the company prefers to be conservative and end all calculations at that time.

- If the required rate of return is 15 per cent, COMPUTE net present value of the project. Is it acceptable?
- ANALYSE what would be the case if the required rate of return were 10 per cent.
- CALCULATE its internal rate of return.
- COMPUTE the project's payback period.

(Study Material ICAI TYK – 03)

Solution:

(a) Computation of NPV at 15% discount rate

Year	Cash Flow (₹)	Discount Factor (15%)	Present Value (₹)
0	(7,00,000)	1.000	(7,00,000)
1	(10,00,000)	0.870	(8,70,000)
2	2,50,000	0.756	1,89,000
3	3,00,000	0.658	1,97,400
4	3,50,000	0.572	2,00,200
5 – 10	4,00,000	2.163	8,65,200
Net Present Value			(1,18,200)

As the net present value is negative, the project is unacceptable.

(b) Computation of NPV if discount rate would be 10% discount rate

Year	Cash Flow (₹)	Discount Factor (10%)	Present Value (₹)
0	(7,00,000)	1.000	(7,00,000)
1	(10,00,000)	0.909	(9,09,000)
2	2,50,000	0.826	2,06,500
3	3,00,000	0.751	2,25,300
4	3,50,000	0.683	2,39,050
5 – 10	4,00,000	2.974	11,89,600
Net Present Value			2,51,450

Since NPV = ₹ 2,51,450 is positive, hence the project would be acceptable.

(c) Calculation of IRR:

$$\begin{aligned}
 \text{IRR} &= \text{LR} + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} \times (\text{HR} - \text{LR}) \\
 &= 10\% + \frac{₹ 2,51,450}{₹ 2,51,450 - (-)1,18,200} \times (15\% - 10\%) \\
 &= 10\% + 3.4012 \text{ or } 13.40\%
 \end{aligned}$$

(d) Computation of Pay-back period of the project:

Payback Period = 6 years:

$$\begin{aligned}
 &- ₹ 7,00,000 - ₹ 10,00,000 + ₹ 2,50,000 + ₹ 3,00,000 + ₹ 3,50,000 + ₹ \\
 &4,00,000 + ₹ 4,00,000 = 0
 \end{aligned}$$

Question – 20

Ae Bee Cee Ltd. is planning to invest in machinery, for which it has to make a choice between the two identical machines, in terms of Capacity, 'X' and 'Y'. Despite being designed differently, both machines do the same job. Further, details regarding both the machines are given below:

Particulars	Machine 'X'	Machine 'Y'
Purchase Cost of the Machine (₹)	15,00,000	10,00,000
Life (years)	3	2
Running cost per year (₹)	4,00,000	6,00,000

The opportunity cost of capital is 9%.

You are required to IDENTIFY the machine which the company should buy?

The present value (PV) factors at 9% are:

Year	t_1	t_2	t_3
$PVIF_{0.09,t}$	0.917	0.842	0.772

(Study Material ICAI TYK – 06)

Solution:**Statement Showing the Evaluation of Two Machines**

	Particulars	Machine 'X'	Machine 'Y'
(i)	Purchase Cost	₹ 15,00,000	₹ 10,00,000
(ii)	Life of Machine	3 years	2 years
(iii)	Running Cost of Machine per year	₹ 4,00,000	₹ 6,00,000
(iv)	PVIFA (0.09, 3)	2.531	
	PVIFA (0.09, 2)		1.759
(v)	PV of Running Cost of Machine $\{(iii) \times (iv)\}$	₹ 10,12,400	₹ 10,55,400
(vi)	Cash outflows of Machine $\{(i) + (v)\}$	₹ 25,12,400	₹ 20,55,400
(vii)	Equivalent PV of Annual Cash outflow $\{(vi) / (iv)\}$	₹ 9,92,651	₹ 11,68,505

Recommendation: Ae Bee Cee Ltd. should buy Machine 'X' since equivalent annual cash outflow is less than that of Machine 'Y'.

Question – 21

NavJeevani hospital is considering to purchase a machine for medical projectional radiography which is priced at ₹ 2,00,000. The projected life of the machine is 8 years and has an expected salvage value of ₹ 18,000 at the end of 8th year. The annual operating cost of the machine is ₹ 22,500. It is expected to generate revenues of ₹ 1,20,000 per year for eight years. Presently, the hospital is outsourcing the radiography work to its neighbour Test Center and is earning commission income of ₹ 36,000 per annum, net of taxes.

Required:

ANALYSE whether it would be profitable for the hospital to purchase the machine. Give your recommendation under:

- (i) Net Present Value method
- (ii) Profitability Index method

Consider tax @30%. PV factors at 10% are given below:

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467

(Study Material ICAI TYK – 08)

Solution:**Determination of Cash inflows**

Particulars	(₹)
Sales Revenue	1,20,000
Less: Operating Cost	22,500
	97,500
Less: Depreciation (₹ 2,00,000 – ₹ 18,000)/8	22,750
Net Income	74,750
Less: Tax @ 30%	22,425
Earnings after Tax (EAT)	52,325
Add: Depreciation	22,750
Cash inflow after tax per annum	75,075
Less: Loss of Commission Income	36,000
Net Cash inflow after tax per annum	39,075
In 8 th Year :	
New Cash inflow after tax	39,075

Add: Salvage Value of Machine	18,000
Net Cash inflow in year 8	57,075

(i) Calculation of Net Present Value (NPV)

Year	CFAT (₹)	PV Factor @10%	Present Value of Cash inflows (₹)
1 to 7	39,075	4.867	1,90,178.03
8	57,075	0.467	26,654.03
			2,16,832.06
Less: Cash Outflows			2,00,000.00
NPV			16,832.06

(ii) Calculation of Profitability Index

$$\begin{aligned}\text{Profitability Index} &= \frac{\text{Sum of discounted cash in flows}}{\text{Present Value of Cash Out flows}} \\ &= \frac{2,16,832.06}{2,00,000} = 1.084\end{aligned}$$

Advise: Since the net present value (NPV) is positive and profitability index is also greater than 1, the hospital may purchase the machine.

Question – 22

XYZ Ltd. is planning to introduce a new product with a project life of 8 years. Initial equipment cost will be ₹ 3.5 crores. Additional equipment costing ₹ 25,00,000 will be purchased at the end of the third year from the cash inflow of this year. At the end of 8 years, the original equipment will have no resale value, but additional equipment can be sold for ₹ 2,50,000. A working capital of ₹ 40,00,000 will be needed and it will be released at the end of eighth year. The project will be financed with sufficient amount of equity capital.

The sales volumes over eight years have been estimated as follows:

Year	1	2	3	4 – 5	6 – 8
Units per year	72,000	1,08,000	2,60,000	2,70,000	1,80,000

A sales price of ₹ 240 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount ₹ 36,00,000 per year. The loss of any year will be set off from the profits of subsequent two years. The company is subject to 30 per cent tax rate and considers 12 per cent

to be an appropriate after-tax cost of capital for this project. The company follows straight line method of depreciation.

CALCULATE the net present value of the project and advise the management to take appropriate decision.

The PV factors at 12% are

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

(Study Material ICAI TYK – 09)

Solution:

Workings:

(a) Calculation of annual cash flows

(₹ in lakh)

Year	Sales	VC	FC	Dep.	Profit	Tax	PAT	Dep.	Cash Inflow
1	172.80	103.68	36	43.75	(10.63)	–	–	43.75	33.12
2	259.20	155.52	36	43.75	23.93	3.99*	19.94	43.75	63.69
3	624.00	374.40	36	43.75	169.85	50.955	118.895	43.75	162.645
4–5	648.00	388.80	36	48.25	174.95	52.485	122.465	48.25	170.715
6–8	432.00	259.20	36	48.25	88.55	26.565	61.985	48.25	110.235

(b) Calculation of Depreciation:

$$\text{- On Initial equipment} = \frac{\text{₹ 350 lakh}}{8 \text{ years}} = 43.75 \text{ lakh}$$

$$\text{- On additional equipment} = \frac{(\text{₹ 25} - \text{₹ 2.5}) \text{ lakh}}{5 \text{ years}} = 4.5 \text{ lakh}$$

(c) *Calculation of tax in 2nd Year:

	₹ in lakh
Profit for the year	23.93
Less: Set off of unabsorbed depreciation in 1 st year	(10.63)
Taxable profit	13.30
Tax @ 30%	3.99

(d) Calculation of Initial cash outflow

	₹ in lakh
Cost of new equipment	350
Add: Working Capital	40
Outflow	390

Calculation of NPV

(₹ in lakh)

Year	Cash flows	PV factor @12%	PV of cash flows	Remark
0	(390)	1.000	(390.00)	Initial equipment cost
1	33.12	0.893	29.57	
2	63.69	0.797	50.76	
3	162.645	0.712	115.80	
3	(25.00)	0.712	(17.80)	Additional equipment cost
4	170.715	0.636	108.57	
5	170.715	0.567	96.79	
6	110.235	0.507	55.89	
7	110.235	0.452	49.83	
8	110.235	0.404	44.53	
8	40.00	0.404	16.16	Release of working capital
8	2.50	0.404	1.01	Additional equipment salvage value
Net Present Value			161.11	

Advise: Since the project has a positive NPV, therefore, it should be accepted.

Question – 23

A chemical company is presently paying an outside firm ₹ 1 per gallon to dispose off the waste resulting from its manufacturing operations. At normal operating capacity, the waste is about 50,000 gallons per year.

After spending ₹ 60,000 on research, the company discovered that the waste could be sold for ₹ 10 per gallon if it was processed further. Additional processing would, however, require an investment of ₹ 6,00,000 in new equipment, which would have an estimated life of 10 years with no salvage value. Depreciation would be calculated by straight line method.

Except for the costs incurred in advertising ₹ 20,000 per year, no change in the present selling and administrative expenses is expected, if the new product is sold. The details of additional processing costs are as follows:

Variable : ₹ 5 per gallon of waste put into process.

Fixed : (Excluding Depreciation) ₹ 30,000 per year.

There will be no losses in processing, and it is assumed that the total waste processed in a given year will be sold in the same year. Estimates indicate that 50,000 gallons of the product could be sold each year.

The management when confronted with the choice of disposing off the waste or processing it further and selling it, seeks your ADVICE. Which alternative would you recommend? Assume that the firm's cost of capital is 15% and it pays on an average 50% Tax on its income.

You should consider Present value of Annuity of ₹ 1 per year @ 15% p.a. for 10 years as 5.019.

(Study Material ICAI TYK – 13)

Solution:

Evaluation of alternatives:

Saving in disposing off the waste

Particulars	(₹)
Outflow (50,000 × ₹ 1)	50,000
Less: tax saving @ 50%	25,000
Net outflow per year	25,000

Calculation of Annual Cash inflows in Processing of waste Material

Particulars	Amount (₹)	Amount (₹)
Sale value of waste (₹ 10 × 50,000 gallon)		5,00,000
Less: Variable processing cost (₹ 5 × 50,000 gallon)	2,50,000	
Less: Fixed processing cost	30,000	
Less: Advertisement cost	20,000	
Less: Depreciation	60,000	(3,60,000)
Earnings before tax (EBT)		1,40,000
Less: Tax @ 50%		(70,000)
Earnings after tax (EAT)		70,000
Add: Depreciation		60,000
Annual Cash inflows		1,30,000

Total Annual Benefits = Annual Cash inflows + Net savings (adjusting tax) in disposal cost

$$= ₹ 1,30,000 + ₹ 25,000 = ₹ 1,55,000$$

Calculation of Net Present Value

Year	Particulars	Amount (₹)
0	Investment in new equipment	(6,00,000)
1 to 10	Total annual benefits × PVAF (10 years, 15%) ₹ 1,55,000 × 5.019	7,77,945
	Net Present Value	1,77,945

Recommendation: Processing of waste is a better option as it gives a positive Net Present Value.

Note- Research cost of ₹ 60,000 is not relevant for decision making as it is sunk cost.

Question – 24

Embros Ltd. is planning to invest in a new product with a project life of 8 years. Initial equipment cost will be ₹ 35 crores. Additional equipment costing ₹ 2.50 crores will be purchased at the end of the third year from the cash inflow of this year. At the end of 8th year, the original equipment will have no resale value, but additional equipment can be sold at 10% of its original cost. A working capital of ₹ 4 crores will be needed, and it will be released at the end of 8th year. The project will be financed with sufficient amount of equity capital.

The sales volumes over eight years have been estimated as follows:

Year	1	2	3	4–5	6–8
Units	14,40,000	21,60,000	52,00,000	54,00,000	36,00,000

Sales price of ₹ 120 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount ₹ 3.60 crores per year. The loss of any year will be set off from the profits of subsequent year. The company follows straight line method of depreciation and is subject to 30% tax rate. Considering 12% after-tax cost of capital for this project, you are required to CALCULATE the net present value (NPV) of the project and advise the management to take appropriate decision.

PV factors @ 12% are:

Year	1	2	3	4	5	6	7	8
	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

Solution:**Calculation of year-wise Cash Inflow****(₹ in crores)**

Year	sales	VC (60% of Sales Value)	FC	Dep.	Profit	Tax (@30%)	PAT	Dep.	Cash Inflow
1	17.28	10.368	3.6	4.375	(1.063)	-	(1.0630)	4.375	3.312
2	25.92	15.552	3.6	4.375	2.393	0.3990*	1.9940	4.375	6.369
3	62.4	37.44	3.6	4.375	16.985	5.0955	11.8895	4.375	16.2645
4 - 5	64.8	38.88	3.6	4.825#	17.495	5.2485	12.2465	4.825	17.0715
6 - 8	43.2	25.92	3.6	4.825	8.855	2.6565	6.1985	4.825	11.0235

*(30% of 2.393 -30% of 1.063) = 0.7179 -0.3189 = 0.3990

#4.375 + (2.50 - .25)/5 = 4.825

Calculation of Cash Outflow at the beginning

Particulars	₹
Cost of New Equipment	35,00,00,000
Add: Working Capital	4,00,00,000
Outflow	39,00,00,000

Calculation of NPV

Year	Cash inflows	PV factor	NPV
	(₹)		(₹)
1	3,31,20,000	.893	2,95,76,160
2	6,36,90,000	.797	5,07,60,930
3	16,26,45,000 - 2,50,00,000 =13,76,45,000	.712	9,80,03,240
4	17,07,15,000	.636	10,85,74,740
5	17,07,15,000	.567	9,67,95,405
6	11,02,35,000	.507	5,58,89,145
7	11,02,35,000	.452	4,98,26,220
8	11,02,35,000 + 4,00,00,000 + 25,00,000 = 15,27,35,000	.404	6,17,04,940
Present Value of Inflow			55,11,30,780
Less: Out flow			39,00,00,000
Net Present Value			16,11,30,780

Advise: Since the project has a positive NPV, it may be accepted.

Question – 25

An existing profitable company, RMC World Ltd. is considering a new project for manufacture of home automation gadget involving a capital expenditure of ₹ 1000 Lakhs and working capital of ₹ 150 Lakhs. The capacity of the plants for an annual production of 3 lakh units and capacity utilization during 5 year life of the project is expected to be as indicated below:

Year	1	2	3	4	5
Capacity Utilization (%)	50	65	80	100	100

The average price per unit of product is expected to be ₹ 600 netting a contribution of 60 percent. The annual fixed costs, excluding depreciation, are estimated to be ₹ 500 Lakhs per annum from the third year onwards. For the first and second year, it would be ₹ 200 lakhs and ₹ 350 lakhs respectively.

Scrap value of the capital asset at the end of 5th year is ₹ 200 Lakhs. Depreciation on capital asset is provided on written down value basis @ 40% p.a. for income tax purpose. The rate of income tax may be taken at 30%. The cost of capital is 12%. At end of the third year an additional investment of ₹ 200 lakhs would be required for working capital. There is no capital gain tax applicable.

COMPUTE the NPV of the project. RMC World Ltd. is about to make a presentation to Secure Venture Capital Firm. Secure Venture Capital Firms will invest in any project if the net addition to shareholder wealth from the project is above ₹ 100 lakhs.

(MTP April – 2024)

Solution:

Calculation of Cash Flow after Tax

	Year 1	Year 2	Year 3	Year 4	Year 5
Capacity	50%	65%	80%	100%	100%
Units	1,50,000	1,95,000	2,40,000	3,00,000	3,00,000
Contribution p.u.	360	360	360	360	360
(600 × 60%)					
Total Contribution	5,40,00,000	7,02,00,000	8,64,00,000	10,80,00,000	10,80,00,000

Less: Fixed Asset	2,00,00,000	3,50,00,000	5,00,00,000	5,00,00,000	5,00,00,000
Less: Depreciation (W.N.)	4,00,00,000	2,40,00,000	1,44,00,000	86,40,000	51,84,000
PBT	(60,00,000)	1,12,00,000	2,20,00,000	4,93,60,000	5,28,16,000
Less: Tax	(18,00,000)	33,60,000	66,00,000	1,48,08,000	1,58,44,800
PAT	(42,00,000)	78,40,000	1,54,00,000	3,45,52,000	3,69,71,200
Add: Depreciation	4,00,00,000	2,40,00,000	1,44,00,000	86,40,000	51,84,000
CFAT	3,58,00,000	3,18,40,000	2,98,00,000	4,31,92,000	4,21,55,200

Calculation of NPV

Year	Description	Cash Flow	PVF @12%	PV
0	Initial Investment	(10,00,00,000)	1	(10,00,00,000)
0	WC introduced	(1,50,00,000)	1	(1,50,00,000)
3	WC introduced	(2,00,00,000)	0.7118	(1,42,36,000)
1	CFAT	3,58,00,000	0.8929	3,19,65,820
2	CFAT	3,18,40,000	0.7972	2,53,82,848
3	CFAT	2,98,00,000	0.7118	2,12,11,640
4	CFAT	4,31,92,000	0.6355	2,74,48,516
5	CFAT	4,21,55,200	0.5674	2,39,18,860
5	WC released	3,50,00,000	0.5674	1,98,59,000
5	Scrap Sale	2,00,00,000	0.5674	1,13,48,000
Net Present Value				3,18,98,684

Working notes (W.N.)

Calculation of Depreciation

Year	Opening WDV	Depreciation	Closing WDV
1	10,00,00,000	4,00,00,000	6,00,00,000
2	6,00,00,000	2,40,00,000	3,60,00,000
3	3,60,00,000	1,44,00,000	2,16,00,000
4	2,16,00,000	86,40,000	1,29,60,000
5	1,29,60,000	51,84,000	77,76,000

Question – 26

A firm can make investment in either of the following two projects. The firm anticipates its cost of capital to be 10%. The pre-tax cash flows of the projects for five years are as follows:

Year	0	1	2	3	4	5
Project A(₹)	(3,00,000)	55,000	1,20,000	1,30,000	1,05,000	40,000
Project B(₹)	(3,00,000)	3,18,000	20,000	20,000	8,000	6,000

Ignore Taxation

An amount of ₹ 45,000 will be spent on account of sales promotion in year 3 in case of Project A. This has not been considered in calculation of pre-tax cash flows.

The discount factors are as under:

Year	0	1	2	3	4	5
PVF (10%)	1	0.91	0.83	0.75	0.68	0.62

You are required to calculate for each project:

- The payback period
- The discounted payback period
- Desirability factor
- Net Present Value

(MTP September – 2023)

Solution:

Calculation of Present Value of cash flows

Year	PV factor @ 10 %	Project -A		Project -B	
		Cash flow (₹)	Discount ed cash flows	Cash flow (₹)	Discount ed cash flows
0	1.00	(3,00,000)	(3,00,000)	(3,00,000)	(3,00,000)
1	0.91	55,000	50,050	3,18,000	2,89,380
2	0.83	1,20,000	99,600	20,000	16,600
3	0.75	85,000(1,30,000 – 45,000)	63,750	20,000	15,000
4	0.68	1,05,000	71,400	8,000	5,440
5	0.62	40,000	24,800	6,000	3,720

Net Present Value		9,600		30,140
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(i) The Payback period of the projects:

Project-A: The cumulative cash inflows up-to year 3 is ₹ 2,60,000 and remaining amount required to equate the cash outflow is ₹ 40,000 i.e. (₹ 3,00,000 - ₹ 2,60,000) which will be recovered from year-4 cash inflow. Hence, Payback period will be calculated as below:

$$3 \text{ year} + \frac{40,000}{1.05,000} = 3.381 \text{ years or 3 years, 4 months, 9 days (approx.)}$$

Project-B: The cash inflow in year-1 is ₹ 3,18,000 and the amount required to equate the cash outflow is ₹ 3,00,000, which can be recovered in a period less than a year. Hence, Payback period will be calculated as below:

$$\frac{3,00,000}{3,18,000} = 0.943 \text{ years or 11 months}$$

(ii) Discounted Payback period for the projects:

Project-A: The cumulative discounted cash inflows up-to year 4 is ₹ 2,84,800 and remaining amount required to equate the cash outflow is ₹ 15,200 i.e. (₹ 3,00,000 - ₹ 2,84,800) which will be recovered from year-5 cash inflow. Hence, Payback period will be calculated as below:

$$4 \text{ year} + \frac{15,200}{24,800} = 4.613 \text{ years or 4 years, 2 months, and 11 days}$$

Project-B: The cash inflow in year-1 is ₹ 2,89,380 and remaining amount required to equate the cash outflow is ₹ 10,620 i.e. (₹ 3,00,000 - ₹ 2,89,380) which will be recovered from year-2 cash inflow. Hence, Payback period will be calculated as below:

$$1 \text{ year} + \frac{10,620}{16,600} = 1.640 \text{ years or 1 Year, 7 months and 23 days.}$$

(iii) Desirability factor of the projects

Desirability Factor (Profitability Index)

$$= \frac{\text{Discounted value Cash Inflows}}{\text{Discounted value of Cash Outflows}}$$

$$\text{Project A} = \frac{3,09,600}{3,00,000} = 1.032$$

$$\text{Project B} = \frac{3,30,140}{3,00,000} = 1.100$$

(iv) Net Present Value (NPV) of the projects:

Please refer the above table.

Project A- ₹ 9,600

Project B- ₹ 30,140

Question – 27

A company has to make a choice between two projects namely A and B. The initial capital outlay of two Projects are ₹ 1,35,000 and ₹ 2,40,000 respectively for A and B. There will be no scrap value at the end of the life of both the projects. The opportunity Cost of Capital of the company is 16%. The annual incomes are as under:

Year	Project A (₹)	Project B (₹)	Discounting factor @ 16%
1	---	60,000	0.862
2	30,000	84,000	0.743
3	1,32,000	96,000	0.641
4	84,000	1,02,000	0.552
5	84,000	90,000	0.476

Required:

CALCULATE for each project:

- Discounted payback period
- Profitability index
- Net present value DECIDE which of these projects should be accepted?

(RTP May – 2018)

Solution:

Working notes**1 Computation of Net Present Values of Projects**

Year	Cash flows		Disct. factor @ 16	Discounted Cash flow	
	Project A (₹)	Project B (₹)		Project A (₹)	Project B (₹)
	1	2	3	(3) × (1)	(3) × (2)
0	(1,35,000)	(2,40,000)	1.000	(1,35,000)	(2,40,000)
1	--	60,000	0.862	--	51,720
2	30,000	84,000	0.743	22,290	62,412
3	1,32,000	96,000	0.641	84,612	61,536
4	84,000	1,02,000	0.552	46,368	56,304
5	84,000	90,000	0.476	39,984	42,840
Net present value				58,254	34,812

2 Computation of Cumulative Present Values of Projects Cash inflows

Year	Project A		Project B	
	PV of cash inflows (₹)	Cumulative PV (₹)	PV (₹) PV of cash inflows (₹)	Cumulative PV (₹)
1	--	--	51,720	51,720
2	22,290	22,290	62,412	1,14,132
3	84,612	1,06,902	61,536	1,75,668
4	46,368	1,53,270	56,304	2,31,972
5	39,984	1,93,254	42,840	2,74,812

(i) Discounted payback period: (Refer to Working note 2)

Cost of Project A = ₹ 1,35,000

Cost of Project B = ₹ 2,40,000

Cumulative PV of cash inflows of Project A after 4 years

= ₹ 1,53,270

Cumulative PV of cash inflows of Project B after 5 years

= ₹ 2,74,812

A comparison of projects cost with their cumulative PV clearly shows that the project A's cost will be recovered in less than 4

years and that of project B in less than 5 years. The exact duration of discounted payback period can be computed as follows:

	Project A	Project B
Excess PV of cash inflows over the project cost (₹)	18,270 (₹ 1,53,270 - ₹ 1,35,000)	34,812 (₹ 2,74,812 - ₹ 2,40,000)
Computation of period required to recover excess amount of cumulative PV over project cost (Refer to Working note 2)	0.39 year (₹ 18,270 ÷ ₹ 46,368)	0.81 years (₹ 34,812 ÷ ₹ 42,840)
Discounted payback period	3.61 year (4-0.39) years	4.19 years (5-0.81) years

(ii) **Profitability Index(PI):**
$$= \frac{\text{Sum of discounted cash inflows}}{\text{Initian cash outlay}}$$

Profitability Index (for Project A) =
$$\frac{₹ 1,93,254}{₹ 1,35,000} = 1.43$$

Profitability Index (for Project B) =
$$\frac{₹ 2,74,812}{₹ 2,40,000} = 1.15$$

(iii) **Net present value (NPV)** (for Project A) = ₹ 58,254

Net present value (NPV) (for Project B) = ₹ 34,812

(Refer to Working note 1)

Conclusion: As the NPV, PI of Project A is higher and Discounted Pay back is lower, therefore Project a should be accepted.

Question – 28

A company is considering the proposal of taking up a new project which requires an investment of ₹ 800 lakhs on machinery and other assets. The project is expected to yield the following earnings (before depreciation and taxes) over the next five years:

Year	Earnings (₹ in lakhs)
1	320
2	320
3	360

4	360
5	300

The cost of raising the additional capital is 12% and assets have to be depreciated at 20% on written down value basis. The scrap value at the end of the five year period may be taken as zero. Income-tax applicable to the company is 40%.

You are required to CALCULATE the net present value of the project and advise the management to take appropriate decision. Also CALCULATE the Internal Rate of Return of the Project.

Note: Present values of Re. 1 at different rates of interest are as follows:

Year	10%	12%	14%	16%	20%
1	0.91	0.89	0.88	0.86	0.83
2	0.83	0.80	0.77	0.74	0.69
3	0.75	0.71	0.67	0.64	0.58
4	0.68	0.64	0.59	0.55	0.48
5	0.62	0.57	0.52	0.48	0.40

(RTP May – 2020)

Solution:

(i) Calculation of Net Cash Flow

(₹ in lakhs)					
Year	Profit before dep. and tax	Depreciation (20% on WDV)	PBT	PAT	Net cash flow
(1)	(2)	(3)	(4)	(5)	(3) + (5)
1	320	$800 \times 20\% = 160$	160	96	256
2	320	$(800 - 160) \times 20\% = 128$	192	115.20	243.20
3	360	$(640 - 128) \times 20\% = 102.4$	257.6	154.56	256.96
4	360	$(512 - 102.4) \times 20\% = 81.92$	278.08	166.85	248.77
5	300	$(409.6 - 81.92) = 327.68^*$	-27.68	-16.61	311.07

*this is treated as a short term capital loss.

(ii) Calculation of Net Present Value (NPV)

(₹ in lakhs)

Year	Net Cash Flow	12%		16%		20%	
		D.F	P.V	D.F	P.V	D.F	P.V
1	256	0.89	227.84	0.86	220.16	0.83	212.48
2	243.20	0.80	194.56	0.74	179.97	0.69	167.81
3	256.96	0.71	182.44	0.64	164.45	0.58	149.03
4	248.77	0.64	159.21	0.55	136.82	0.48	119.41
5	311.07	0.57	177.31	0.48	149.31	0.40	124.43
			941.36		850.71		773.16
	Less: Initial Investment		800.00		800.00		800.00
		NPV	141.36		50.71		-26.84

(iii) Advise: Since Net Present Value of the project at 12% = 141.36 lakhs, therefore the project should be implemented.

(iv) Calculation of Internal Rate of Return (IRR)

$$\begin{aligned} \text{IRR} &= 16\% + \frac{50.71 \times 4}{50.71 - (-26.84)} \\ &= 16\% + \frac{2.03}{77.55} = 16\% + 2.62\% = 18.62\%. \end{aligned}$$

Question – 29

Dharma Ltd, an existing profit-making company, is planning to introduce a new product with a projected life of 8 years. Initial equipment cost will be ₹ 240 lakhs and additional equipment costing ₹ 26 lakhs will be needed at the beginning of third year. At the end of 8 years, the original equipment will have resale value equivalent to the cost of removal, but the additional equipment would be sold for ₹ 2 lakhs. Working Capital of ₹ 25 lakhs will be needed at the beginning of the operations. The 100% capacity of the plant is of 4,00,000 units per annum, but the production and sales volume expected are as under:

Year	Capacity (%)
1	20
2	30
3-5	75
6-8	50

A sale price of ₹100 per unit with a profit volume ratio (contribution/sales) of 60% is likely to be obtained. Fixed operating cash cost are likely to be ₹ 16

lakhs per annum. In addition to this the advertisement expenditure will have to be incurred as under:

Year	1	2	3-5	6-8
Expenditure (₹ Lakhs each year)	30	15	10	4

The company is subjected to 50% tax rate and consider 12% to be an appropriate cost of capital. Straight line method of depreciation is followed by the company. ADVISE the management on the desirability of the project.

(RTP May – 2023)

Solution:

Calculation of Cash Flow After tax

	Year	1	2	3 to 5	6 to 8
A	Capacity	20%	30%	75%	50%
B	Units	80,000	1,20,000	3,00,000	2,00,000
C	Contribution p.u.	₹ 60	₹ 60	₹ 60	₹ 60
D	Contribution	₹ 48,00,000	₹ 72,00,000	₹ 1,80,00,000	₹ 1,20,00,000
E	Fixed Cash Cost	₹ 16,00,000	₹ 16,00,000	₹ 16,00,000	₹ 16,00,000
	Depreciation				
F	Original Equipment (₹240Lakhs/8)	₹ 30,00,000	₹ 30,00,000	₹ 30,00,000	₹ 30,00,000
G	Additional Equipment (₹ 24Lakhs/6)	--	--	₹ 4,00,000	₹ 4,00,000
H	Advertisement Expenditure	₹ 30,00,000	₹ 15,00,000	₹ 10,00,000	₹ 4,00,000
I	Profit Before Tax (DE-F-G-H)	₹ (28,00,000)	₹ 11,00,000	₹ 1,20,00,000	₹ 66,00,000
J	Tax savings/ (expenditure)	₹ 14,00,000	₹ (5,50,000)	₹ (60,00,000)	₹ (33,00,000)
K	Profit After Tax	₹ (14,00,000)	₹ 5,50,000	₹ 60,00,000	₹ 33,00,000
L	Add: Depreciation (F+G)	₹ 30,00,000	₹ 30,00,000	₹ 34,00,000	₹ 34,00,000
M	Cash Flow After Tax	₹16,00,000	₹ 35,50,000	₹ 94,00,000	₹ 67,00,000

Calculation of NPV				
Year	Particulars	Cash Flows	PV Factor	PV
	Initial Investment	₹ (2,40,00,000)	1.000	₹ (2,40,00,000)

0	Working Capital Introduced	₹ (25,00,000)	1.000	₹ (25,00,000)
1	CFAT	₹16,00,000	0.893	₹ 14,28,800
2	CFAT	₹ 35,50,000	0.797	₹ 28,29,350
2	Additional Equipment	₹ (26,00,000)	0.797	₹ (20,72,200)
3	CFAT	₹ 94,00,000	0.712	₹ 66,92,800
4	CFAT	₹ 94,00,000	0.636	₹ 59,78,400
5	CFAT	₹ 94,00,000	0.567	₹ 53,29,800
6	CFAT	₹ 67,00,000	0.507	₹ 33,96,900
7	CFAT	₹ 67,00,000	0.452	₹ 30,28,400
8	CFAT	₹ 67,00,000	0.404	₹ 27,06,800
8	WC Released	₹ 25,00,000	0.404	₹ 10,10,000
8	Salvage Value	₹ 2,00,000	0.404	₹ 80,800
	Net Present Value			₹ 39,09,850

Since the NPV is positive, the proposed project should be implemented.

Question – 30

MTR Limited is considering buying a new machine which would have a useful economic life of five years, at a cost of ₹ 25,00,000 and a scrap value of ₹ 3,00,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 75,000 units per annum of a new product with an estimated selling price of ₹ 300 per unit. Direct costs would be ₹ 285 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹ 8,40,000 per annum.

In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to ₹ 1,00,000 and ₹ 1,50,000 respectively.

EVALUATE the project using the NPV method of investment appraisal, assuming the company's cost of capital to be 15 percent.

(RTP Nov – 2019)

Solution:

Calculation of Net Cash flows

$$\text{Contribution} = (300 - 285) \times 75,000 = ₹ 11,25,000$$

$$\text{Fixed costs} = 8,40,000 - [(25,00,000 - 3,00,000)/5] = ₹ 4,00,000$$

Year	Capital (₹)	Contribution (₹)	Fixed costs (₹)	Adverts (₹)	Net cash flow (₹)
0	(20,00,000)				(20,00,000)
1	(5,00,000)	11,25,000	(4,00,000)	(1,00,000)	1,25,000
2		11,25,000	(4,00,000)	(1,50,000)	5,75,000
3		11,25,000	(4,00,000)		7,25,000
4		11,25,000	(4,00,000)		7,25,000
5	3,00,000	11,25,000	(4,00,000)		10,25,000

Calculation of Net Present Value

Year	Net cash flow (₹)	12% discount factor	Present value (₹)
0	(20,00,000)	1.000	(20,00,000)
1	1,25,000	0.892	1,11,500
2	5,75,000	0.797	4,58,275
3	7,25,000	0.711	5,15,475
4	7,25,000	0.635	4,60,375
5	10,25,000	0.567	5,81,175
			1,26,800.

The net present value of the project is ₹ 1,26,800.

Question – 31

K. K. M. M Hospital is considering purchasing an MRI machine. Presently, the hospital is outsourcing the work received relating to MRI machine and is earning commission of ₹ 6,60,000 per annum (net of tax). The following details are given regarding the machine:

	(₹)
Cost of MRI machine	90,00,000
Operating cost per annum (excluding Depreciation)	14,00,000
Expected revenue per annum	45,00,000
Salvage value of the machine (after 5 years)	10,00,000
Expected life of the machine	5 years

Assuming tax rate @ 40%, whether it would be profitable for the hospital to purchase the machine?

Give your RECOMMENDATION under:

- Net Present Value Method, and
- Profitability Index Method.

PV factors at 10% are given below:

Year	1	2	3	4	5
PV factor	0.909	0.826	0.751	0.683	0.620

(RTP Nov – 2022)

Solution:

Determination of Cash inflows

Elements	(₹)
Sales Revenue	45,00,000
Less: Operating Cost	14,00,000
	31,00,000
Less: Depreciation (90,00,000 – 10,00,000)/5	16,00,000
Net Income	15,00,000
Tax @ 40%	6,00,000
Earnings after Tax (EAT)	9,00,000
Add: Depreciation	16,00,000
Cash inflow after tax per annum	25,00,000
Less: Loss of Commission Income	6,60,000
Net Cash inflow after tax per annum	18,40,000
In 5 th Year:	
New Cash inflow after tax	18,40,000
Add: Salvage Value of Machine	10,00,000
Net Cash inflow in year 5	28,40,000

Calculation of Net Present Value (NPV)

Year	CFAT	PV Factor @10%	Present Value of Cash inflows
1 to 4	18,40,000	3.169	58,30,960
5	28,40,000	0.620	<u>17,60,800</u>
			75,91,760
Less: Cash Outflows			<u>90,00,000</u>
NPV			<u>(14,08,240)</u>

$$\text{Profitability Index} = \frac{\text{Sum of discounted cash inflows}}{\text{Present value of cash outflows}} = \frac{75,91,760}{90,00,000} = 0.844$$

Advise: Since the net present value is negative and profitability index is also less than 1, therefore, the hospital should not purchase the MRI machine.

Question – 32

PQR Limited is considering buying a new machine which would have a useful economic life of five years, at a cost of ₹ 40,00,000 and a scrap value of ₹ 5,00,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 80,000 units per annum of a new product with an estimated selling price of ₹ 400 per unit. Direct costs would be ₹ 375 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹ 10,40,000 per annum. In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to ₹ 1,25,000 and ₹ 1,75,000 respectively.

EVALUATE the project using the NPV method of investment appraisal, assuming the company's cost of capital to be 12 percent.

(RTP Nov – 2023)

Solution:

Calculation of Net Cash flows

$$\text{Contribution} = (400 - 375) \times 80,000 = ₹ 20,00,000$$

$$\text{Fixed costs} = 10,40,000 - [(40,00,000 - 5,00,000) / 5] = ₹ 3,40,000$$

Year	Capital (₹)	Contribution (₹)	Fixed Costs (₹)	Promotion (₹)	Net Cash Flow (₹)
0	(32,00,000)				(32,00,000)
1	(8,00,000)	20,00,000	(3,40,000)	(1,25,000)	7,35,000
2		20,00,000	(3,40,000)	(1,75,000)	14,85,000
3		20,00,000	(3,40,000)		16,60,000
4		20,00,000	(3,40,000)		16,60,000
5	5,00,000	20,00,000	(3,40,000)		21,60,000

Calculation of Net Present Value

Year	Net Cash Flow (₹)	12% Discount Factor	Present Value (₹)
0	(32,00,000)	1.000	(32,00,000)
1	7,35,000	0.893	6,56,355
2	14,85,000	0.797	11,83,545
3	16,60,000	0.712	11,81,920
4	16,60,000	0.636	10,55,760
5	21,60,000	0.567	12,24,720

21,02,300

The net present value of the project is ₹ 21,02,300.

Question – 33

Stand Ltd. is contemplating replacement of one of its machines which has become outdated and inefficient. Its financial manager has prepared a report outlining two possible replacement machines. The details of each machine are as follows:-

	Machine 1	Machine 2
Initial Investment	₹ 12,00,000	₹ 16,00,000
Estimated useful life	3 years	5 years
Residual value	₹ 1,20,000	₹ 1,00,000
Contribution per annum	₹ 11,60,000	₹ 12,00,000
Fixed maintenance costs per annum	₹ 40,000	₹ 80,000
Other fixed operating costs per annum	₹ 7,20,000	₹ 6,10,000

The maintenance cost are payable annually in advance. All other cash flows apart from the initial investment assumed to occur at the end of each year. Depreciation has been calculated by straight line method and has been included in other fixed operating costs. The expected cost of capital for this project is assumed as 12% p.a.

Required:

- Which machine is more beneficial, using annualized equivalent approach? Ignore tax.
- Calculate the sensitivity of your recommendation in part (i) to changes in the contribution generated by machine 1.

Year	1	2	3	4	5	6
PVIF _{0.12,t}	0.893	0.797	0.712	0.636	0.567	0.507
PVIFA _{0.12,t}	0.893	1.690	2.402	3.038	3.605	4.112

(Exam, Dec – 2021)

Solution:

(i) Calculation of Net Cash flows

Machine 1

Other fixed operating costs (excluding depreciation)

$$= 7,20,000 - [(12,00,000 - 1,20,000) / 3] = ₹ 3,60,000$$

Year	Initial Investment (₹)	Contribution (₹)	Fixed maintenance costs (₹)	Other fixed operating costs (excluding depreciation) (₹)	Residual Value (₹)	Net cash flow (₹)
0	(12,00,000)		(40,000)			(12,40,000)
1		11,60,000	(40,000)	(3,60,000)		7,60,000
2		11,60,000	(40,000)	(3,60,000)		7,60,000
3		11,60,000		(3,60,000)	1,20,000	9,20,000

Machine 2

Other fixed operating costs (excluding depreciation)

$$= 6,10,000 - [(16,00,000 - 1,00,000) / 5] = ₹ 3,10,000$$

Year	Initial Investment (₹)	Contribution (₹)	Fixed maintenance costs (₹)	Other fixed operating costs (excluding depreciation) (₹)	Residual Value (₹)	Net cash flow (₹)
0	(16,00,000)		(80,000)			(16,80,000)
1		12,00,000	(80,000)	(3,10,000)		8,10,000
2		12,00,000	(80,000)	(3,10,000)		8,10,000
3		12,00,000	(80,000)	(3,10,000)		8,10,000
4		12,00,000	(80,000)	(3,10,000)		8,10,000
5		12,00,000		(3,10,000)	1,00,000	9,90,000

Calculation of Net Present Value

Year	12% discount factor	Machine 1		Machine 2	
		Net cash flow (₹)	Present value (₹)	Net cash flow (₹)	Present value (₹)
0	1.000	(12,40,000)	(12,40,000)	(16,80,000)	(16,80,000)
1	0.893	7,60,000	6,78,680	8,10,000	7,23,330
2	0.797	7,60,000	6,05,720	8,10,000	6,45,570
3	0.712	9,20,000	6,55,040	8,10,000	5,76,720
4	0.636			8,10,000	5,15,160
5	0.567			9,90,000	5,61,330

NPV @ 12%	6,99,440		13,42,110
PVAF @ 12%	2.402		3.605
Equivalent Annualized Criterion	2,91,190.674		3,72,291.262

Recommendation: Machine 2 is more beneficial using Equivalent Annualized Criterion.

(ii) Calculation of sensitivity of recommendation in part (i) to changes in the contribution generated by machine 1

Difference in Equivalent Annualized Criterion of Machines required for changing the recommendation in part (i)

$$= 3,72,291.262 - 2,91,190.674 = ₹ 81,100.588$$

$$\therefore \text{Sensitivity relating to contribution} = \frac{₹ 81,100.588}{₹ 11,60,000.00} \times 100$$

$$= 6.991 \text{ or } \mathbf{7\% \text{ yearly}}$$

Alternatively,

The annualized equivalent cash flow for machine 1 is lower by ₹ (3,72,291.262 - 2,91,190.674) = ₹ 81,100.588 than for machine 2. Therefore, it would need to increase contribution for complete 3 years before the decision would be to invest in this machine.

$$\text{Sensitivity w.r.t contribution} = 81,100.588 / (11,60,000 \times 2.402) \times 100$$

$$= 2.911\%$$

Question – 34

A company wants to buy a machine, and two different models namely A and B are available. Following further particulars are available:

Particulars	Machine-A	Machine-B
Original Cost (₹)	8,00,000	6,00,000
Estimated Life in year	4	4
Salvage Value (₹)	0	0

The company provides depreciation under Straight Line Method. Income tax rate applicable is 30%.

The present value of ₹ 1 at 12% discounting factor and net profit before depreciation and tax are as under:

Year	Net Profit Before Depreciation and tax		PV Factor
	Machine-A ₹	Machine-B ₹	
1	2,30,000	1,75,000	0.893
2	2,40,000	2,60,000	0.797
3	2,20,000	3,20,000	0.712
4	5,60,000	1,50,000	0.636

Calculate:

1. NPV (Net Present Value)
2. Discounted pay-back period
3. PI (Profitability Index)

Suggest : Purchase of which machine is more beneficial under Discounted payback period method, NPV method and PI method.

(Exam Jan – 2021)

Solution:

Workings:

(i) Calculation of Annual Depreciation

$$\text{Depreciation on Machine - A} = \frac{\text{₹ 8,00,000}}{4} = \text{₹ 2,00,000}$$

$$\text{Depreciation on Machine - B} = \frac{\text{₹ 6,00,000}}{4} = \text{₹ 1,50,000}$$

(ii) Calculation of Annual Cash Inflows

Particulars	Machine-A (₹)			
	1	2	3	4
Net Profit before Depreciation and Tax	2,30,000	2,40,000	2,20,000	5,60,000
Less: Depreciation	2,00,000	2,00,000	2,00,000	2,00,000
Profit before Tax	30,000	40,000	20,000	3,60,000
Less: Tax @ 30%	9,000	12,000	6,000	1,08,000

Profit after Tax	21,000	28,000	14,000	2,52,000
Add: Depreciation	2,00,000	2,00,000	2,00,000	2,00,000
Annual Cash Inflows	2,21,000	2,28,000	2,14,000	4,52,000

Particulars	Machine-B (₹)			
	1	2	3	4
Net Profit before Depreciation and Tax	1,75,000	2,60,000	3,20,000	1,50,000
Less: Depreciation	1,50,000	1,50,000	1,50,000	1,50,000
Profit before Tax	25,000	1,10,000	1,70,000	0
Less: Tax @ 30%	7,500	33,000	51,000	0
Profit after Tax	17,500	77,000	1,19,000	0
Add: Depreciation	1,50,000	1,50,000	1,50,000	1,50,000
Annual Cash Inflows	1,67,500	2,27,000	2,69,000	1,50,000

(iii) Calculation of PV of Cash Flows

Year	Machine - A				Machine - B		
	PV of Re 1 @ 12%	Cash flow (₹)	PV (₹)	Cumulative PV (₹)	Cash flow (₹)	PV (₹)	Cumulative PV (₹)
1	0.893	2,21,000	1,97,353	1,97,353	1,67,500	1,49,578	1,49,578
2	0.797	2,28,000	1,81,716	3,79,069	2,27,000	1,80,919	3,30,497
3	0.712	2,14,000	1,52,368	5,31,437	2,69,000	1,91,528	5,22,025
4	0.636	4,52,000	2,87,472	8,18,909	1,50,000	95,400	6,17,425

1. NPV (Net Present Value)

Machine - A

$$\text{NPV} = ₹ 8,18,909 - ₹ 8,00,000 = ₹ \mathbf{18,909}$$

Machine - B

$$\text{NPV} = ₹ 6,17,425 - ₹ 6,00,000 = ₹ 17,425$$

2. Discounted Payback Period

Machine - A

$$\begin{aligned} \text{Discounted Payback Period} &= 3 + \frac{₹ 8,00,000 - ₹ 5,31,437}{₹ 2,87,472} \\ &= 3 + 0.934 \end{aligned}$$

= 3.934 years or 3 years 11.21 months

Machine – B

Discounted Payback Period = $3 + \frac{₹ 6,00,000 - ₹ 5,22,025}{₹ 95,400}$
 = 3 + 0.817
 = 3.817 years or 3 years 9.80 months

3. PI (Profitability Index)

Machine – A

Profitability Index = $\frac{₹ 8,18,909}{₹ 8,00,000} = 1.024$

Machine – B

Profitability Index = $\frac{₹ 6,17,425}{₹ 6,00,000} = 1.029$

Suggestion:

Method	Machine - A	Machine - B	Suggested Machine
Net Present Value	₹ 18,909	₹ 17,425	Machine A
Discounted Payback Period	3.934 years	3.817 years	Machine B
Profitability Index	1.024	1.029	Machine B

Question – 35

Maruti Ltd. requires a plant costing ₹ 200 lakhs for a period of 5 years. The company can use the plant for the stipulated period through leasing arrangement or the requisite amount can be borrowed to buy the plant. In case of leasing, the company received a proposal to pay annual lease rent of ₹ 48 lakhs at the end of each year for a period of 5 years.

In case of purchase, the company would have a 12%, 5 years loan to be paid in equated annual installment, each installment becoming due in the beginning of each year. It is estimated that plant can be sold for ₹ 40 lakhs at the end of 5th year. The company uses straight line method of depreciation. Corporate tax rate is 30%. Cost of Capital after tax for the company is 10%.

The PVIF @ 10% and 12% for the five years are given below;

Year	1	2	3	4	5
PVIF @ 10%	0.909	0.826	0.751	0.683	0.621

PVIF @ 12%	0.893	0.797	0.712	0.636	0.567
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You are required to advise whether the plant should be purchased or taken on lease.

(Exam, May – 2018)

Solution:

Purchase Option

Loan installment = ₹ 200 lakhs / (1 + PVIFA 12%, 4)

= ₹ 200 lakhs / (1 + 3.038) = ₹ 49.53 lakhs

Interest payable = (₹ 49.53 × 5) – ₹ 200 lakhs = ₹ 47.65 lakhs

Working note:

Amortization of Loan Installment

Year	Loan amount (₹ In Lakhs)	Installment (₹ In Lakhs)	Interest (₹ In Lakhs)	Principal (₹ In Lakhs)	O/S Amount (₹ In Lakhs)
0	200	49.53	0.00	49.53	150.47
1	150.47	49.53	18.06	31.47	119.00
2	119.00	49.53	14.28	35.25	83.75
3	83.75	49.53	10.05	39.48	44.27
4	44.27	49.53	*5.26	44.27	-
5	0	0	0	0	0

Calculation of PV of outflow under Purchase Option

(₹ In Lakhs)

(1) End	(2) Debt Payment	(3) Int. of the o/s Principal	(4) Dep.	(5) Tax Shield [(3) + (4)] × 0.3	(6) Net Cash outflows (2) – (5)	(7) PV factors @ 10%	(8) PV
0	49.53	0.00	0.00	0.00	49.53	1.000	49.53
1	49.53	18.06	32.00	15.02	34.51	0.909	31.37
2	49.53	14.28	32.00	13.88	35.65	0.826	29.44

3	49.53	10.05	32.00	12.61	36.92	0.751	27.72
4	49.53	*5.26	32.00	11.18	38.35	0.683	26.19
5	49.53	0	32.00	9.60	(9.60)	0.621	(5.96)
		47.65	160.00				158.29
Less: PV of Salvage Value (₹ 40 lakhs × 0.621) =							24.84
Total PV of Outflow							133.45

*Balancing Figure

Leasing Option

$$\begin{aligned}\text{PV of Outflows under lease @ 10\%} &= ₹ 48 \text{ lakhs} \times (1-0.30) \times 3.790 \\ &= ₹ 127.34 \text{ lakhs}\end{aligned}$$

Decision: The plant should be taken on lease because the PV of outflows is less as compared to purchase option.

Question – 36

AT Limited is considering three projects A, B and C. The cash flows associated with the projects are given below :

Cash flows associated with the three projects (₹)

Project	C ₀	C ₁	C ₂	C ₃	C ₄
A	(10,000)	2,000	2,000	6,000	0
B	(2,000)	0	2,000	4,000	6,000
C	(10,000)	2,000	2,000	6,000	10,000

You are required to :

- Calculate the payback period of each of the three project.
- If the cut-off period is two years, then which project should be accepted should be accepted ?
- Project with positive NPVs if the opportunity cost of capital is 10 percent.
- “Payback gives too much weight to cash flows that occur after the cut-off date”. True or false ?
- “If a firm used a single cut-off period for all projects, it is likely to accept too many short lived project” True or false ?

P.V. Factor @ 10%

Year	0	1	2	3	4	5
P.V.	1.000	0.909	0.826	0.751	0.683	0.621

(Exam May – 2019)

Solution:**(a) Payback Period of Projects**

Projects	C ₀ (₹)	C ₁ (₹)	C ₂ (₹)	C ₃ (₹)	Payback
A	(10,000)	2000	2000	6,000	2,000 + 2,000 + 6,000 = 10,000 i.e 3 years
B	(2,000)	0	2,000	NA	0 + 2,000 = 2,000 i.e 2 years
C	(10,000)	2000	2000	6,000	2,000 + 2,000 + 6,000 = 10,000 i.e 3 years

(b) If standard payback period is **2 years**, Project B is the **only acceptable project**.

(c) Calculation of NPV

Year	PVF @ 10%	Project A		Project B		Project C	
		Cash Flows (₹)	PV of cash flows (₹)	Cash Flows (₹)	PV of cash flows (₹)	Cash Flows (₹)	PV of cash flows (₹)
0	1	(10,000)	(10,000)	(2,000)	(2,000)	(10,000)	(10,000)
1	0.909	2,000	1,818	0	0	2,000	1,818
2	0.826	2,000	1,652	2,000	1,652	2,000	1,652
3	0.751	6,000	4506	4,000	3004	6,000	4,506
4	0.683	0	0	6,000	4,098	10,000	6,830
NPV			(-2,024)		6,754		4,806

So, Projects with positive NPV are Project B and Project C

(d) **False.** Payback gives no weightage to cash flows after the cut-off date.

(e) **True.** The payback rule ignores all cash flows after the cutoff date, meaning that future years' cash inflows are not considered. Thus, payback is biased towards short-term projects.

Question – 37

Alpha Limited is a manufacturer of computers. It wants to introduce artificial intelligence while making computers. The estimated annual saving from introduction of the artificial intelligence (AI) is as follows:

- Reduction of five employees with annual salaries of ₹ 3,00,000
- Reduction of ₹ 3,00,000 in production delays caused by inventory problem
- Reduction in lost sales ₹2,50,000 and
- Gain due to timely billing ₹ 2,00,000

The Purchase price of the system for installation of artificial intelligence is ₹ 20,00,000 and installation cost is ₹ 1,00,000. 80% of the purchase price will be paid in the year of purchase and remaining will be paid in next year.

The estimated life of the system is 5 years and it will be depreciated on a straight-line basis.

However, the operation of the new system requires two computer specialists with annual salaries of ₹ 5,00,000 per person.

In addition to above, annual maintenance and operating cost for five years are as below:

Year	1	2	3	4	5
Maintenance & Operation cost	2,00,000	1,80,000	1,60,000	1,40,000	1,20,000

Maintenance and operating cost are payable in advance.

The Company's tax rate is 30% and its required rate of return is 15%.

Year	1	2	3	4	5
PVIF _{0.10,t}	0.909	0.826	0.751	0.683	0.621
PVIF _{0.12,t}	0.893	0.797	0.712	0.636	0.567
PVIF _{0.15,t}	0.870	0.756	0.658	0.572	0.497

Evaluate the project by using net present value and profitability index.

(Exam May – 2022)

Solution:

Computation of Annual Cash Flow after Tax						
Particulars	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Savings in Salaries		15,00,000	15,00,000	15,00,000	15,00,000	15,00,000
Reduction in Production Delays		3,00,000	3,00,000	3,00,000	3,00,000	3,00,000
Reduction in Lost Sales		2,50,000	2,50,000	2,50,000	2,50,000	2,50,000
Gain due to Timely Billing		2,00,000	2,00,000	2,00,000	2,00,000	2,00,000
Salary to Computer Specialist		(10,00,000)	10,00,000	10,00,000	10,00,000	10,00,000
Maintenance and Operating Cost (payable in advance)		(2,00,000)	(1,80,000)	(1,60,000)	(1,40,000)	(1,20,000)
Depreciation (21 lakhs/5)		(4,20,000)	(4,20,000)	(4,20,000)	(4,20,000)	(4,20,000)
Gain Before Tax		6,30,000	6,50,000	6,70,000	6,90,000	7,10,000
Less: Tax (30%)		1,89,000	1,95,000	2,01,000	2,07,000	2,13,000
Gain After Tax		4,41,000	4,55,000	4,69,000	4,83,000	4,97,000
Add: Depreciation		4,20,000	4,20,000	4,20,000	4,20,000	4,20,000
Add: Maintenance and Operating Cost (payable in advance)		2,00,000	1,80,000	1,60,000	1,40,000	1,20,000
Less: Maintenance and Operating Cost (payable in advance)	(2,00,000)	(1,80,000)	(1,60,000)	(1,40,000)	(1,20,000)	-
Net CFAT	(2,00,000)	8,81,000	8,95,000	9,09,000	9,23,000	10,37,000

Note: Annual cash flows can also be calculated Considering tax shield on depreciation & maintenance and operating cost. There will be no change in the final cash flows after tax.

Computation of NPV				
Particulars	Year	Cash Flows (₹)	PVF	PV (₹)
Initial Investment (80% of 20 Lacs)	0	16,00,000	1	16,00,000
Installation Expenses	0	1,00,000	1	1,00,000
Installment of Purchase Price	1	4,00,000	0.870	3,48,000
PV of Outflows (A)				20,48,000
CFAT	0	(2,00,000)	1	(2,00,000)
CFAT	1	8,81,000	0.870	7,66,470
CFAT	2	8,95,000	0.756	6,76,620
CFAT	3	9,09,000	0.658	5,98,122
CFAT	4	9,23,000	0.572	5,27,956
CFAT	5	10,37,000	0.497	5,15,389
PV of Inflows (B)				28,84,557
NPV (B-A)				8,36,557
Profitability Index (B/A)				1.408 or 1.41

Evaluation: Since the NPV is positive (i.e. ₹ 8,36,557) and Profitability Index is also greater than 1 (i.e. 1.41), Alpha Ltd. may introduce artificial intelligence (AI) while making computers.

Question – 38

PD Ltd. an existing company, is planning to introduce a new product with projected life of 8 year. Project cost will be ₹ 2,40,00,000. At the end of 8 years no residual value will be realized. Working capital of ₹30,00,000 will be needed. The 100% capacity of the project is 2,00,000 units p.a but the production and Sales Volume is expected are as under:

Year	Number of units
1	60,000 units
2	80,000 units
3-5	1,40,000 units
6-8	1,20,000 units

Other Information :

- Selling price per unit ₹ 200
- Variable cost is 40% of sales.
- Fixed cost p.a. 30,00,000.

- (iv) In addition to this advertisement expenditure will have to be incurred as under:

Year	1	2	3-5	6-8
Expenditure (₹)	50,00,000	25,00,000	10,00,000	5,00,000

- (v) Income Tax is 25%.
- (vi) Straight line method of depreciation is permissible for tax purpose.
- (vii) Cost of capital is 10%.
- (viii) Assume that loss cannot be carried forward.

Present Value Table

Year	1	2	3	4	5	6	7	8
PVF @ 10%	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467

Advise about the project acceptability.

(Exam Nov – 2018)

Solution:

(1) Calculation of Annual Cash Inflows:

Years	1	2	3 - 5	6 - 8
(a) Sales in units	60,000	80,000	1,40,000	1,20,000
	₹	₹	₹	₹
(b) Contribution @ ₹ 120 p.u. [SP 200 × 60% PV Ratio]	72,00,000	96,00,000	1,68,00,000	1,44,00,000
(c) Fixed cost	30,00,000	30,00,000	30,00,000	30,00,000
(d) Advertisement	50,00,000	25,00,000	10,00,000	5,00,000
(e) Depreciation (2,40,00,000/8)	30,00,000	30,00,000	30,00,000	30,00,000
(f) Profit / (Loss) [b - c - d - e]	(38,00,000)	11,00,000	98,00,000	79,00,000
(g) Tax @ 25%	*(9,50,000)	2,75,000	24,50,000	19,75,000
(h) Profit/(Loss) after tax [f - g]	(28,50,000)	8,25,000	73,50,000	59,25,000
(i) Cash inflow [h + e]	1,50,000	38,25,000	1,03,50,000	89,25,000

***Note :** PD Ltd. is an existing company, hence it is assumed that the loss of year 1 can be set off with other income of year 1 itself and hence tax @ 25% can be saved in year 1.

(2) Computation of NPV:

Particulars	Year	Cashflow (₹)	PVF @ 10%	PV (₹)
Initial Project cost	0	(2,40,00,000)	1.00	(2,40,00,000)
Investment in working capital	0	(30,00,000)	1.00	(30,00,000)
Annual Cash Inflows : (WN1)	1	1,50,000	0.909	1,36,350
	2	38,25,000	0.826	31,59,450
	3	1,03,50,000	0.751	77,72,850
	4	1,03,50,000	0.683	70,69,050
	5	1,03,50,000	0.621	64,27,350
	6	89,25,000	0.564	50,33,700
	7	89,25,000	0.513	45,78,525
	8	89,25,000	0.467	41,67,975
Release of working capital	8	30,00,000	0.467	14,01,000
Net Present Value (NPV)			NPV	1,27,46,250

Recommendation: Accept the project in view of positive NPV.

Question – 39

CK Ltd. is planning to buy a new machine. Details of which are as follows:

Cost of the Machine at the commencement	₹ 2,50,000
Economic Life of the Machine	8 year
Residual Value	Nil
Annual Production Capacity of the Machine	1,00,000 units
Estimated Selling Price per unit	₹ 6
Estimated Variable Cost per unit	₹ 3
Estimated Annual Fixed Cost (Excluding depreciation)	₹ 1,00,000
Advertisement Expenses in 1st year in addition of annual fixed cost	₹ 20,000

Maintenance Expenses in 5th year in addition
of annual fixed cost ₹ 30,000

Cost of Capital 12%

Ignore Tax. Analyze the above-mentioned proposal using the Net Present Value Method and advice. P.V. factor @ 12% are as under:

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

(Exam Nov – 2020)

Solution:

Calculation of Net Cash flows

Contribution = (₹ 6 – ₹ 3) × 1,00,000 units = ₹ 3,00,000

Fixed costs (excluding depreciation) = ₹ 1,00,000

Year	Capital (₹)	Contribution (₹)	Fixed costs (₹)	Advertisement/ Maintenance expenses (₹)	Net cash flow (₹)
0	(2,50,000)				(2,50,000)
1		3,00,000	(1,00,000)	(20,000)	1,80,000
2		3,00,000	(1,00,000)		2,00,000
3		3,00,000	(1,00,000)		2,00,000
4		3,00,000	(1,00,000)		2,00,000
5		3,00,000	(1,00,000)	(30,000)	1,70,000
6		3,00,000	(1,00,000)		2,00,000
7		3,00,000	(1,00,000)		2,00,000
8		3,00,000	(1,00,000)		2,00,000

Calculation of Net Present Value

Year	Net cash flow (₹)	12% discount factor	Present value (₹)
0	(2,50,000)	1.000	(2,50,000)
1	1,80,000	0.893	1,60,740
2	2,00,000	0.797	1,59,400
3	2,00,000	0.712	1,42,400
4	2,00,000	0.636	1,27,200
5	1,70,000	0.567	96,390
6	2,00,000	0.507	1,01,400
7	2,00,000	0.452	90,400
8	2,00,000	0.404	80,800
			7,08,730

Advise: CK Ltd. should buy the new machine, as the net present value of the proposal is positive i.e ₹ 7,08,730.

Question – 40

A firm is in need of a small vehicle to make deliveries. It is intending to choose between two options. One option is to buy a new three wheeler that would cost ₹ 1,50,000 and will remain in service for 10 years.

The other alternative is to buy a second hand vehicle for ₹ 80,000 that could remain in service for 5 years. Thereafter the firm, can buy another second hand vehicle for ₹ 60,000 that will last for another 5 years.

The scrap value of the discarded vehicle will be equal to its written down value (WDV). The firm pays 30% tax and is allowed to claim depreciation on vehicles @ 25% on WDV basis.

The cost of capital of the firm is 12%.

You are required to advise the best option.

Given:

t	1	2	3	4	5	6	7	8	9	10
PVIF (t,12%)	0.892	0.797	0.711	0.635	0.567	0.506	0.452	0.403	0.360	0.322

(Exam, Nov – 2022)

Solution:

Selection of Investment Decision

Tax shield on Purchase of New vehicle			
Year	WDV	Dep. @ 25%	Tax shield @ 30%
1	1,50,000	37,500	11,250
2	1,12,500	28,125	8,437
3	84,375	21,094	6,328
4	63,281	15,820	4,746
5	47,461	11,865	3,560
6	35,596	8,899	2,670
7	26,697	6,674	2,002
8	20,023	5,006	1,502
9	15,017	3,754	1,126
10	11,263	2,816	845
11	8,447	Scrap value	

Tax shield on Purchase of Second hand vehicles

Tax shield on Purchase of New vehicle			
Year	WDV	Dep. @ 25%	Tax shield @ 30%
1	80,000	20,000	6,000
2	60,000	15,000	4,500
3	45,000	11,250	3,375
4	33,750	8,437	2,531
5	25,313	6,328	1,898
6	60,000	15,000	4,500
7	45,000	11,250	3,375
8	33,750	8,437	2,531
9	25,313	6,328	1,898
10	18,985	4,746	1,424

Scrap value = ₹ 18,985

Scrap value = ₹ 14,239

Calculation of PV of Net outflow of New Vehicle

Year	Cash OF/IF	PV Factor	PV of OF/IF
0	1,50,000	1	1,50,000
1	(11,250)	0.892	(10,035)
2	(8,437)	0.797	(6,724)
3	(6,328)	0.711	(4,499)
4	(4,746)	0.635	(3,014)
5	(3,560)	0.567	(2,018)
6	(2,670)	0.506	(1,351)

7	(2,002)	0.452	(905)
8	(1,502)	0.403	(605)
9	(1,126)	0.360	(405)
10	(845 + 8447)	0.322	(2,992)
		PVNOF	1,17,452

Calculation of PV of Net outflow of Second hand Vehicles

Year	Cash OF/IF	PV Factor	PV of OF/IF
0	80,000	1	80,000
1	(6,000)	0.892	(5,352)
2	(4,500)	0.797	(3,587)
3	(3,375)	0.711	(2,400)
4	(2,531)	0.635	(1,607)
5	$(60000 - 18985 - 1898) = 39,117$	0.567	22,179
6	(4,500)	0.506	(2,277)
7	(3,375)	0.452	(1,525)
8	(2,531)	0.403	(1,020)
9	(1,898)	0.360	(683)
10	$(1424 + 14239) = (15,663)$	0.322	(5,043)
		PVNOF	78,686

Advise: The PV of net outflow is low in case of buying the second hand vehicles. Therefore, it is advisable to buy second hand vehicles.

Question – 41

A hospital is considering to purchase a diagnostic machine costing ₹ 80,000. The projected life of the machine is 8 years and has an expected salvage value of ₹ 6,000 at the end of 8 years. The annual operating cost of the machine is ₹ 7,500. It is expected to generate revenues of ₹ 40,000 per year for eight years. Presently, the hospital is outsourcing the diagnostic work and is earning commission income of ₹ 12,000 per annum.

Consider tax rate of 30% and Discounting Rate as 10%.

Advise:

Whether it would be profitable for the hospital to purchase the machine?

Give your recommendation as per Net Present Value method and Present Value Index method under below mentioned two situations:

(i) If Commission income of ₹ 12,000 p.a. is before taxes.

(ii) If Commission income of ₹ 12,000 p.a. is net of taxes.

Given:

t	1	2	3	4	5	6	7	8
PVIF (t,10%)	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467

(Exam, Nov – 2022)

Solution:

Analysis of Investment Decisions

Determination of Cash inflows	Situation-(i) Commission Income before taxes	Situation-(ii) Commission Income after taxes
Cash flow up-to 7 th year:		
Sales Revenue	40,000	40,000
Less: Operating Cost	(7,500)	(7,500)
	32,500	32,500
Less: Depreciation $(80,000 - 6,000) \div 8$	(9,250)	(9,250)
Net Income	23,250	23,250
Tax @ 30%	(6,975)	(6,975)
Earnings after Tax (EAT)	16,275	16,275
Add: Depreciation	9,250	9,250
Cash inflow after tax per annum	25,525	25,525
Less: Loss of Commission Income	(8,400)	(12,000)
Net Cash inflow after tax per annum	17,125	13,525
In 8 th Year:		
Net Cash inflow after tax	17,125	13,525
Add: Salvage Value of Machine	6,000	6,000
Net Cash inflow in year 8	23,125	19,525

Calculation of Net Present Value (NPV) and Profitability Index (PI)

	Particulars	PV factor @10%	Situation-(i) [Commission Income before taxes]	Situation-(ii) [Commission Income after taxes]
A	Present value of cash inflows (1st to 7th year)	4.867	83,347.38 (17,125 × 4.867)	65,826.18 (13,525 × 4.867)
B	Present value of cash inflow at 8 th year	0.467	10,799.38 (23,125 × 0.467)	9,118.18 (19,525 × 0.467)

C	PV of cash inflows		94,146.76	74,944.36
D	Less: Cash Outflow	1.00	(80,000)	(80,000)
E	Net Present Value (NPV)		14,146.76	(5,055.64)
F	PI = (C÷D)		1.18	0.94

Recommendation: The hospital may consider purchasing of diagnostic machine in situation (i) where commission income is 12,000 before tax as NPV is positive and PI is also greater than 1. Contrary to situation (i), in situation (ii) where the commission income is net of tax, the recommendation is reversed to not purchase the machine as NPV is negative and PI is also less than 1.

Question – 42

ABC Ltd. is considering to purchase a machine which is priced at ₹ 5,00,000. The estimated life of machine is 5 years and has an expected salvage value of ₹ 45,000 at the end of 5 years. It is expected to generate revenues of ₹ 1,50,000 per annum for five years. The annual operating cost of the machine is ₹ 28,125, Corporate Tax Rate is 20% and the cost of capital is 10%.

You are required to analyze whether it would be profitable for the company to purchase the machine by using;

- (i) Payback period Method
- (ii) Net Present value method
- (iii) Profitability Index Method

(Exam, Nov – 2023)

Solution:

Computation of Annual Cash Flows

Particular	(₹)
Revenue	1,50,000
Less: Operating Cost	(28,125)
Less: Depreciation $\frac{(5,00,000 - 45,000)}{5}$	(91,000)
Profit before Tax	30,875
Less: Tax	(6,175)
Profit after Tax	24,700
Add: Depreciation	91,000
Annual Cash Inflows	1,15,700

(i) Computation of Payback Period

Year	Cash Flows	Cumulative Present Value
1	1,15,700	1,15,700
2	1,15,700	2,31,400
3	1,15,700	3,47,100
4	1,15,700	4,62,800
5 (Including Salvage)	1,60,700	6,23,500

Amount to be recovered in 5th year cash flow = ₹ 5,00,000 – ₹ 4,62,800
= ₹ 37,200

Payback period = 4 years + $\frac{37,200}{1,60,700}$ = 4.23 years

Since the payback period is less than the life of machinery, the company may purchase the machine.

(ii) Computation of Net Present Value

Year	Cash Flows	PVF @10%	Present Value
0	(5,00,000)	1.000	(5,00,000)
1 - 5	1,15,700	3.791	4,38,594
5	45,000	0.621	27,941
Net Present Value			(33,465)

Since the net present value (NPV) is negative, the company should not purchase the machine.

(iii) Computation of Profitability Index (PI)

$$\begin{aligned} \text{Profitability Index (PI)} &= \frac{\text{Sum of present value of net cash inflow}}{\text{Initial cash outflow}} \\ &= \frac{\text{₹ 4,38,594} + \text{₹ 27,941}}{\text{₹ 5,00,000}} = 0.93 \end{aligned}$$

Since the profitability index is less than 1, the company should not purchase the machine.

(2) REPLACEMENT DECISION**Question – 43**

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹ 2,40,000 on 31st March. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹ 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,00,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 4,50,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 7.5% is considering that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old machine (₹)	New machine (₹)
Sales	8,10,000	8,10,000
Material cost	1,80,000	1,26,250
Labour cost	1,35,000	1,10,000
Variable overhead	56,250	47,500
Fixed overhead	90,000	97,500
Depreciation	24,000	41,500
PBT	3,24,750	3,87,250
Tax @ 30%	97,425	1,16,175
PAT	2,27,325	2,71,075

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386

(Study Material ICAI Illus – 18)

Solution:

Workings:**1. Calculation of Base for depreciation or Cost of New Machine**

Particulars	(₹)
Purchase price of new machine	4,50,000
Less: Sale price of old machine	1,00,000
	3,50,000

2. Calculation of Profit before tax as per books

Particulars	Old Machine (₹)	New Machine (₹)	Difference (₹)
PBT as per books	3,24,750	3,87,250	62,500
Add: Depreciation as per books	24,000	41,500	17,500
Profit before tax and depreciation (PBSD)	3,48,750	4,28,750	80,000

Calculation of Incremental NPV

Year	PVF @ 10%	PBSD (₹)	Dep. @ 7.5% (₹)	PBT (₹)	Tax @ 30% (₹)	Cash Inflows (₹)	PV of Cash Inflows (₹)
	(1)	(2)	(3)	(4)	(5) = (4) × 0.30	(6) = (4) – (5) + (3)	(7) = (6) × (1)
1	0.909	80,000.00	26,250.00	53,750.00	16,125.00	63,875.00	58,062.38
2	0.826	80,000.00	24,281.25	55,718.75	16,715.63	63,284.38	52,272.89
3	0.751	80,000.00	22,460.16	57,539.84	17,261.95	62,738.05	47,116.27
4	0.683	80,000.00	20,775.64	59,224.36	17,767.31	62,232.69	42,504.93
5	0.621	80,000.00	19,217.47	60,782.53	18,234.76	61,765.24	38,356.21
6	0.564	80,000.00	17,776.16	62,223.84	18,667.15	61,332.85	34,591.73
7	0.513	80,000.00	16,442.95	63,557.05	19,067.12	60,932.88	31,258.57
8	0.467	80,000.00	15,209.73	64,790.27	19,437.08	60,562.92	28,282.88
9	0.424	80,000.00	14,069.00	65,931.00	19,779.30	60,220.70	25,533.58
10	0.386	80,000.00	13,013.82	66,986.18	20,095.85	59,904.15	23,123.00
							3,81,102.44
Add: PV of Salvage value of new machine (₹ 35,000 × 0.386)							13,510.00
Total PV of incremental cash inflows							3,94,612.44
Less: Cost of new machine							3,50,000.00
Incremental Net Present Value							44,612.44

Analysis: Since the Incremental NPV is positive, the old machine should be replaced.

Question – 44

Lockwood Limited wants to replace its old machine with a new automatic machine. Two models A and B are available at the same cost of ₹ 5 lakhs each. Salvage value of the old machine is ₹ 1 lakh. The utilities of the existing machine can be used if the company purchases model A. Additional cost of utilities to be purchased in this case will be ₹ 1 lakh. If the company purchases B, then all the existing utilities will have to be replaced with new utilities costing ₹ 2 lakhs. The salvage value of the old utilities will be ₹ 0.20 lakhs. The cash flows are expected to be:

Year	Cash inflows of A (₹)	Cash inflows of B (₹)	P.V. Factor @ 15%
1	1,00,000	2,00,000	0.870
2	1,50,000	2,10,000	0.756
3	1,80,000	1,80,000	0.658
4	2,00,000	1,70,000	0.572
5	1,70,000	40,000	0.497
Salvage Value at the end of Year 5	50,000	60,000	

The targeted return on capital is 15%. You are required to (i) COMPUTE, for the two machines separately, net present value, discounted payback period and desirability factor and (ii) STATE which of the machines is to be selected?

(Study Material ICAI TYK – 02)

Solution:**Working:****Calculation of Cash -outflow at year zero**

Particulars	A (₹)	B (₹)
Cost of Machine	5,00,000	5,00,000
Cost of Utilities	1,00,000	2,00,000
Salvage value of Old Machine	(1,00,000)	(1,00,000)
Salvage of value Old Utilities	–	(20,000)
Total Expenditure (Net)	5,00,000	5,00,000

(i) (a) Calculation of NPV

Year	PV Factor	Machine A		Machine B	
		Cash	Discounted	Cash	Discounted

	@ 15%	Inflows (₹)	value of inflows (₹)	Inflows (₹)	value of inflows (₹)
0	1.000	(5,00,000)	(5,00,000)	(5,80,000)	(5,80,000)
1	0.870	1,00,000	87,000	2,00,000	1,74,000
2	0.756	1,50,000	1,13,400	2,10,000	1,58,760
3	0.658	1,80,000	1,18,440	1,80,000	1,18,440
4	0.572	2,00,000	1,14,400	1,70,000	97,240
5	0.497	1,70,000	84,490	40,000	19,880
Salvage	0.497	50,000	24,850	60,000	29,820
Net Present Value			42,580		18,140

Since the Net present Value of both the machines is positive both are acceptable.

(b) Discounted Pay-back Period

(Amount in ₹)

Year	Machine A		Machine B	
	Discounted cash inflows	Cumulative Discounted cash inflows	Discounted cash inflows	Cumulative Discounted cash inflows
1	87,000	87,000	1,74,000	1,74,000
2	1,13,400	2,00,400	1,58,760	3,32,760
3	1,18,440	3,18,840	1,18,440	4,51,200
4	1,14,400	4,33,240	97,240	5,48,440
5	1,09,340*	5,42,580	49,700*	5,98,140

* Includes salvage value.

Discounted Payback Period (For A and B):

$$\text{Machine A} = 4 \text{ years} + \left(\frac{5,00,000 - 4,33,240}{1,09,340} \right) = 4.61 \text{ years}$$

$$\text{Machine B} = 4 \text{ years} + \left(\frac{5,80,000 - 5,48,440}{49,700} \right) = 4.63 \text{ years}$$

(c) Desirability Factor or Profitability Index:

$$\text{Profitability Index (PI)} = \frac{\text{Sum of present value of net cash inflow}}{\text{Initial cash outflow}}$$

$$\text{Machine A} = \frac{₹ 5,42,580}{₹ 5,00,000} = 1.08;$$

$$\text{Machine A} = \frac{\text{₹ } 5,98,140}{\text{₹ } 5,80,000} = 1.03$$

- (ii) Since the absolute surplus in the case of A is more than B and also the desirability factor, it is better to choose A.

The discounted payback period in both the cases is almost same, also the net present value is positive in both the cases, but the desirability factor (profitability index) is higher in the case of Machine A, it is therefore better to choose Machine A.

Question – 45

Cello Limited is considering buying a new machine which would have a useful economic life of five years, a cost of ₹ 1,25,000 and a scrap value of ₹ 30,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 50,000 units per annum of a new product with an estimated selling price of ₹ 3 per unit. Direct costs would be ₹ 1.75 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹ 40,000 per annum.

In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to ₹ 10,000 and ₹ 15,000 respectively.

CALCULATE NPV of the project for investment appraisal, assuming that the company's cost of capital is 10 percent.

(Study Material ICAI TYK – 05)

Solution:

Calculation of Net Cash flow

$$\text{Contribution} = (3.00 - 1.75) \times 50,000 = \text{₹ } 62,500$$

$$\text{Fixed costs} = 40,000 - [(1,25,000 - 30,000)/5] = \text{₹ } 21,000$$

Year	Capital (₹)	Contribution (₹)	Fixed costs (₹)	Adverts (₹)	Net cash flow (₹)
0	(1,00,000)	-	-	-	(1,00,000)
1	(25,000)	62,500	(21,000)	(10,000)	6,500
2	-	62,500	(21,000)	(15,000)	26,500
3	-	62,500	(21,000)	-	41,500
4	-	62,500	(21,000)	-	41,500

5	-	62,500	(21,000)	-	71,500
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Calculation of Net Present Value

Year	Net cash flow (₹)	10% discount factor	Present value (₹)
0	(1,00,000)	1.000	(1,00,000)
1	6,500	0.909	5,909
2	26,500	0.826	21,889
3	41,500	0.751	31,167
4	41,500	0.683	28,345
5	71,500	0.621	44,402
Net Present Value			31,712

The net present value of the project is ₹ 31,712.

Question – 46

Xavly Ltd. has a machine which has been in operation for 3 years. The machine has a remaining estimated useful life of 5 years with no salvage value in the end. Its current market value is ₹ 2,00,000. The company is considering a proposal to purchase a new model of machine to replace the existing machine. The relevant information is as follows:

	Existing Machine	New Machine
Cost of machine	₹ 3,30,000	₹ 10,00,000
Estimated life	8 years	5 years
Salvage value	Nil	₹ 40,000
Annual output	30,000 units	75,000 units
Selling price per unit	₹ 15	₹ 15
Annual operating hours	3,000	3,000
Material cost per unit	₹ 4	₹ 4
Labour cost per hour	₹ 40	₹ 70
Indirect cash cost per annum	₹ 50,000	₹ 65,000

The company uses written down value of depreciation @ 20% and it has several other machines in the block of assets. The Income tax rate is 30 per cent and Xavly Ltd. does not make any investment, if it yields less than 12 per cent.

ADVISE Xavly Ltd. whether the existing machine should be replaced or not.

PV factors @12%:

Year	1	2	3	4	5
PVF	0.893	0.797	0.712	0.636	0.567

(Study Material ICAI TYK – 11)

Solution:**(i) Calculation of Net Initial Cash Outflows:**

	₹
Cost of new machine	10,00,000
Less: Sale proceeds of existing machine	2,00,000
Net initial cash outflows	8,00,000

(ii) Calculation of Base for depreciation

Particulars	₹
WDV of Existing Machine	
Cost of existing machine	3,30,000
Less: Depreciation for Year 1	66,000
Depreciation for Year 2	52,800
Depreciation for Year 3	<u>42,240</u>
WDV of Existing Machine (i)	1,68,960
Depreciation base of New Machine	
Cost of new machine	10,00,000
Add: WDV of existing machine	1,68,960
Less: Sales value of existing machine	2,00,000
Depreciation base of New Machine (ii)	9,68,960
Base for incremental depreciation [(ii) – (i)]	8,00,000

(iii) Calculation of annual profit before tax and depreciation

Particulars	Existing machine	New Machine	Differential
(1)	(2)	(3)	(4)=(3)–(2)
Annual output	30,000 units	75,000 units	45,000 units
	₹	₹	₹
(A) Sales revenue @ ₹ 15 per unit	4,50,000	11,25,000	6,75,000
(B) Less: Cost of Operation			
Material @ ₹ 4 per unit	1,20,000	3,00,000	1,80,000
Labour			
Old = 3,000 × ₹ 40	1,20,000		90,000

New = 3,000 × ₹ 70		2,10,000	
Indirect cash cost	50,000	65,000	15,000
Total Cost (B)	2,90,000	5,75,000	2,85,000
Profit Before Tax and depreciation (PBT) (A – B)	1,60,000	5,50,000	3,90,000

(iv) Calculation of Incremental Net Present Value:

Year	PBT	Dep. @ 20%	PBT	Tax @ 30%	Net cash flow	PVF @ 12%	PV
(1)	(2)	(3)	(4=2-3)	(5)	(6=4-5+3)	(7)	(8=6 × 7)
1	3,90,000	1,60,000	2,30,000	69,000.00	3,21,000.00	0.893	2,86,653.00
2	3,90,000	1,28,000	2,62,000	78,600.00	3,11,400.00	0.797	2,48,185.80
3	3,90,000	1,02,400	2,87,600	86,280.00	3,03,720.00	0.712	2,16,248.64
4	3,90,000	81,920	3,08,080	92,424.00	2,97,576.00	0.636	1,89,258.34
5	3,90,000	65,536	3,24,464	97,339.20	2,92,660.80	0.567	1,65,938.67
							11,06,284.45
Add: PV of Salvage Value of new machine (₹ 40,000 × 0.567)							22,680.00
Less: Initial Cash Outflow							8,00,000.00
NPV							3,28,964.45

Advice: Since the incremental NPV is positive, existing machine should be replaced.

Question – 47

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%.

REQUIRED:

When should the company replace the machine?

(Note: Present value of an annuity of Re. 1 per period for 8 years at interest rate of 15% : 4.4873; present value of Re. 1 to be received after 8 years at interest rate of 15% : 0.3269).

(Study Material ICAI TYK – 12)

Solution:

A & Co.

Equivalent cost of (EAC) of new machine

		₹
(i)	Cost of new machine now	90,000
	Add: PV of annual repairs @ ₹ 10,000 per annum for 8 years (₹ 10,000 × 4.4873)	<u>44,873</u>
		1,34,873
	Less: PV of salvage value at the end of 8 years (₹ 20,000 × 0.3269)	<u>6,538</u>
		1,28,335
	Equivalent annual cost (EAC) (₹ 1,28,335/4.4873)	<u>28,600</u>

**PV of cost of replacing the old machine in each of 4 years
with new machine**

Scenario	Year	Cash Flow	PV @ 15%	PV
		(₹)		(₹)
Replace Immediately	0	(28,600)	1.00	28,600
		40,000	1.00	<u>40,000</u>
				<u>11,400</u>
Replace in one year	1	(28,600)	0.870	(24,882)
	1	(10,000)	0.870	(8,700)
	1	25,000	0.870	<u>21,750</u>
				<u>(11,832)</u>
Replace in two years	1	(10,000)	0.870	(8,700)
	2	(28,600)	0.756	(21,622)
	2	(20,000)	0.756	(15,120)
	2	15,000	0.756	<u>11,340</u>
				<u>(34,102)</u>
Replace in three years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)

	3	(28,600)	0.658	(18,819)
	3	(30,000)	0.658	(19,740)
	3	10,000	0.658	<u>6,580</u>
				<u>(55,799)</u>
Replace in four years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(30,000)	0.658	(19,740)
	4	(28,600)	0.572	(16,359)
	4	(40,000)	0.572	<u>(22,880)</u>
				<u>(82,799)</u>

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

Question – 48

GG Pathology Lab Ltd. is using 2D sonography machine which has reached the end of its useful life. The lab is intending to upgrade along with the technology by investing in 3D sonography machine as per the choices preferred by the patients. Following new 3D sonography machine of two different brands with same features is available in the market:

Brand	Cost of Machine (₹)	Life of Machine (₹)	Maintenance Cost (₹)			SLM Depreciation rate (%)
			Year 1-15	Year 6-10	Year 11-15	
X	15,00,000	15	50,000	70,000	98,000	6
Y	10,00,000	10	70,000	1,15,000	-	6

Residual Value of machines shall be dropped by 10% and 40% of Purchase price for Brand X and Y respectively in the first year and thereafter shall be depreciated at the rate mentioned above on the original cost.

Alternatively, the machine of Brand Y can also be taken on rent to be returned back to the owner after use on the following terms and conditions:

- Annual Rent shall be paid in the beginning of each year and for first year it shall be ₹ 2,24,000. Annual Rent for the subsequent 4 years shall be ₹ 2,25,000.
- Annual Rent for the final 5 years shall be ₹ 2,70,000.
- The Rent/Agreement can be terminated by GG Labs by making a payment of Rs. 2,20,000 as penalty. This penalty would be reduced by ₹ 22,000 each year of the period of rental agreement.

You are required to:

- (i) ADVISE which brand of 3D sonography machine should be acquired assuming that the use of machine shall be continued for a period of 20 years.
- (ii) STATE which of the option is most economical if machine is likely to be used for a period of 5 years?

The cost of capital of GG Labs is 12%.

The present value factor of Rs. 1 @ 12% for different years is given as under:

Year	PVF	Year	PVF
1	0.893	9	0.361
2	0.797	10	0.322
3	0.712	11	0.287
4	0.636	12	0.257
5	0.567	13	0.229
6	0.507	14	0.205
7	0.452	15	0.183
8	0.404	16	0.163

(MTP March – 2021)

Solution:

Since the life span of each machine is different and time span exceeds the useful lives of each model, we shall use Equivalent Annual Cost method to decide which brand should be chosen.

(i) If machine is used for 20 years

- (a) Residual value of machine of brand X

$$= [₹ 15,00,000 - (1 - 0.10)] - (₹ 15,00,000 \times 0.06 \times 14)$$

$$= ₹ 90,000$$

- (b) Residual value of machine of brand Y

$$= [₹ 10,00,000 - (1 - 0.40)] - (₹ 10,00,000 \times 0.06 \times 9)$$

$$= ₹ 60,000$$

Present Value (PV) of cost if machine of brand X is purchased

Period	Cash Outflow (₹)	PVF @ 12%	PV (₹)
0	15,00,000	1.000	15,00,000
1- 5	50,000	3.605	1,80,250
6 - 10	70,000	2.046	1,43,220
11 - 15	98,000	1.161	1,13,778
15	(90,000)	0.183	(16,470)
			19,20,778

PVAF for 1-15 years = ₹ 6.812

$$\text{Equivalent Annual Cost} = \frac{\text{₹ } 19,20,778}{6.812} = \text{₹ } 2,81,969.76$$

Present Value (PV) of cost if machine of brand Y is purchased

Period	Cash Outflow (₹)	PVF @ 12%	PV (₹)
0	10,00,000	1.000	10,00,000
1 -5	70,000	3.605	2,52,350
6 -10	1,15,000	2.046	2,35,290
10	(60,000)	0.322	(19,320)
			14,68,320

PVAF for 1-10 years = 5.651

$$\text{Equivalent Annual Cost} = \frac{\text{₹ } 14,68,320}{5.651} = \text{₹ } 2,59,833.66$$

Present Value (PV) of cost if machine of brand Y is taken on rent

Period	Cash Outflow (₹)	PVF @ 12%	PV (₹)
0	2,24,000	1.000	2,24,000
1 -4	2,25,000	3.038	6,83,550
5 - 9	2,70,000	2.291	6,18,570
			15,26,120

PVAF for 1-10 years = 5.651

$$\text{Equivalent Annual Cost} = \frac{\text{₹ } 15,26,120}{5.651} = \text{₹ } 2,70,061.94$$

Decision: Since Equivalent Annual Cash Outflow is least in case of purchase of Machine of brand Y the same should be purchased.

(ii) If machine is used for 5 years

(a) Scrap value of machine of brand X

$$= [₹ 15,00,000 - (1 - 0.10)] - (₹ 15,00,000 \times 0.06 \times 4) = ₹ 9,90,000$$

(b) Scrap value of machine of brand Y

$$= [₹ 10,00,000 - (1 - 0.40)] - (₹ 10,00,000 \times 0.06 \times 4) = ₹ 3,60,000$$

Present Value (PV) of cost if machine of brand X is purchased

Period	Cash Outflow (₹)	PVF @ 12%	PV (₹)
0	15,00,000	1.000	15,00,000
1 - 5	50,000	3.605	1,80,250
5	(9,90,000)	0.567	(5,61,330)
			11,18,920

Present Value (PV) of cost if machine of brand Y is purchased

Period	Cash Outflow (₹)	PVF @ 12%	PV (₹)
0	10,00,000	1.000	10,00,000
1 - 5	70,000	3.605	2,52,350
5	(3,60,000)	0.567	(2,04,120)
			10,48,230

Present Value (PV) of cost if machine of brand Y is taken on rent

Period	Cash Outflow (₹)	PVF @ 12%	PV (₹)
0	2,24,000	1.000	2,24,000
1 - 4	2,25,000	3.038	6,83,550
5	1,10,000*	0.567	62,370
			9,69,920

$$* [₹ 2,20,000 - (₹ 22,000 \times 5) = ₹ 1,10,000]$$

Decision: Since Cash Outflow is least in case of rent of Machine of brand Y the same should be taken on rent.

Question – 49

Yellow bells Ltd. wants to replace its old machine with new automatic machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹ 3,50,000 on 31st March 2022. The machine cannot fetch more than ₹ 45,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,60,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 6,50,000. The expected life of new machine is 10 years with salvage value of ₹ 63,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 9% is allowed taking that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old Machine (₹)	New Machine(₹)
Sales	11,74,500	11,74,500
Material cost	2,61,000	1,83,063
Labour cost	1,95,750	1,59,500
Variable overhead	81,563	68,875
Fixed overhead	1,30,500	1,41,375
Depreciation	34,800	60,175
Profit Before Tax(PBT)	4,70,088	5,61,513
Tax @ 25%	1,17,722	1,40,378
Profit After Tax(PAT)	3,53,166	4,21,134

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386

(MTP March – 2023)

Solution:**(i) Calculation of Base for depreciation or Cost of New Machine**

Particulars	(₹)
Purchase price of new machine	6,50,000
Less: Sale price of old machine	1,60,000
	4,90,000

(ii) Calculation of Profit before tax as per books

Particulars	Old machine	New machine	Difference
	(₹)	(₹)	(₹)
PBT as per books	4,70,888	5,61,513	90,625
Add: Depreciation as per books	34,800	60,175	25,375
Profit before tax and depreciation (PBTD)	5,05,688	6,21,688	1,16,000

Calculation of Incremental NPV

Year	PVF @ 10 %	PBTD (₹)	Dep. @ 9 % (₹)	PBT (₹)	Tax @ 25 % (₹)	Cash Inflow (₹)	PV of Cash Inflow (₹)
	1	2	3	4 (2-3)	5 = (4) × 0.25	6 = (4) – (5) + (3)	7
1	0.909	1,16,000.00	44,100.00	71,900.00	17,975.00	98,025.00	89,104.73
2	0.826	1,16,000.00	40,131.00	75,869.00	18,967.25	97,032.75	80,149.05
3	0.751	1,16,000.00	36,519.21	79,480.79	19,870.20	96,129.80	72,193.48
4	0.683	1,16,000.00	33,232.48	82,767.52	20,691.88	95,308.12	65,095.45
5	0.621	1,16,000.00	30,241.56	85,758.44	21,439.61	94,560.39	58,722.00
6	0.564	1,16,000.00	27,519.82	88,480.18	22,120.05	93,879.95	52,948.29
7	0.513	1,16,000.00	25,043.03	90,956.97	22,739.24	93,260.76	47,842.77
8	0.467	1,16,000.00	22,789.16	93,210.84	23,302.71	92,697.29	43,289.63
9	0.424	1,16,000.00	20,738.14	95,261.86	23,815.47	92,184.53	39,086.24
10	0.386	1,16,000.00	18,871.70	97,128.30	24,282.07	91,717.93	35,403.12
							5,83,834.77
Add: PV of Salvage value of new machine (₹ 63,000 ₹ 0.386)							24,318.00
Total PV of incremental cash inflows							6,08,152.77
Less: Cost of new machine [as calculated in point (i)]							4,90,000.00
Incremental Net Present Value							1,18,152.77

Analysis: Since the Incremental NPV is positive, the old machine should be replaced.

Question – 50

The General Manager of Merry Ltd. is considering the replacement of five-year-old equipment. The company has to incur excessive maintenance cost of the equipment. The equipment has zero written down value. It can be modernized at a cost of ₹ 1,40,000 enhancing its economic life to 5 years. The equipment

could be sold for ₹ 30,000 after 5 years. The modernization would help in material handling and in reducing labour, maintenance & repairs costs.

The company has another alternative to buy a new machine at a cost of ₹ 3,50,000 with an economic life of 5 years and salvage value of ₹ 60,000. The new machine is expected to be more efficient in reducing costs of material handling, labour, maintenance & repairs, etc.

The annual cost are as follows:

	Existing Equipment (₹)	Modernization (₹)	New Machine (₹)
Wages & Salaries	45,000	35,500	15,000
Supervision	20,000	10,000	7,000
Maintenance	25,000	5,000	2,500
Power	30,000	20,000	15,000
	1,20,000	70,500	39,500

Assuming tax rate of 50% and required rate of return of 10%, should the company modernize the equipment or buy a new machine?

PV factor at 10% are as follows:

Year	1	2	3	4	5
PV Factor	0.909	0.826	0.751	0.683	0.621

(RTP May – 2021)

Solution:

Workings:

Calculation of Depreciation:

$$\text{On Modernized Equipment} = \frac{\text{₹ } 1,40,000 - \text{₹ } 30,000}{5 \text{ years}} = \text{₹ } 22,000 \text{ p.a.}$$

$$\text{On New machine} = \frac{\text{₹ } 3,50,000 - \text{₹ } 60,000}{5 \text{ years}} = \text{₹ } 58,000 \text{ p.a.}$$

(i) Calculation of Incremental annual cash inflows/ savings:

Particulars	Existing Equipment	Modernization		New Machine	
	(₹)	Amount (₹)	Savings (₹)	Amount (₹)	Savings (₹)
	(1)	(2)	(3)=(1)-(2)	(4)	(5)=(1)-(4)
Wages & Salaries	45,000	35,500	9,500	15,000	30,000
Supervision	20,000	10,000	10,000	7,000	13,000
Maintenance	25,000	5,000	20,000	2,500	22,500
Power	30,000	20,000	10,000	15,000	15,000
Total	1,20,000	70,500	49,500	39,500	80,500
Less: Depreciation (Refer Workings)			22,000		58,000
Total Savings			27,500		22,500
Less: Tax @ 50%			13,750		11,250
After Tax Savings			13,750		11,250
Add: Depreciation			22,000		58,000
Incremental Annual Cash Inflows			35,750		69,250

(ii) Calculation of Net Present Value (NPV)

Particulars	Year	Modernization (₹)	New Machine (₹)
Initial Cash outflow (A)	0	1,40,000.00	3,50,000.00
Incremental Cash Inflows	1-5	1,35,492.50 (35,750 × 3.790)	2,62,457.50 (69,250 × 3.790)
Salvage value	5	18,630.00 (30,000 × 0.621)	37,260.00 (60,000 × 0.621)
PV of Cash inflows (B)		1,54,122.50	2,99,717.50
Net Present Value (B - A)		14,122.50	(50,282.50)

Advise: The company should modernize its existing equipment and not buy a new machine because NPV is positive in modernization of equipment.

Question – 51

ABC & Co. is considering whether to replace an existing machine or to spend money on revamping it. ABC & Co. currently pays no taxes. The replacement machine costs ₹ 18,00,000 now and requires maintenance of ₹ 2,00,000 at the end of every year for eight years. At the end of eight years, it would have a salvage value of ₹ 4,00,000 and would be sold. The existing machine requires

increasing amounts of maintenance each year and its salvage value fall each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	8,00,000
1	2,00,000	5,00,000
2	4,00,000	3,00,000
3	6,00,000	2,00,000
4	8,00,000	0

The opportunity cost of capital for ABC & Co. is 15%.

REQUIRED:

When should the company replace the machine?

The following present value table is given for you:

Year	Present Value of ₹ 1 at 15% discount rate
1	0.8696
2	0.7561
3	0.6575
4	0.5718
5	0.4972
6	0.4323
7	0.3759
8	0.3269

(RTP May – 2022)

Solution:

ABC & Co.

Equivalent Annual Cost (EAC) of new machine

		(₹)
(i)	Cost of new machine now	18,00,000
	Add: PV of annual repairs @ ₹ 2,00,000 per annum for 8 years (₹ 2,00,000 × 4.4873)	8,97,460
		26,97,460
	Less: PV of salvage value at the end of 8 years (₹ 4,00,000 × 0.3269)	1,30,760
		25,66,700

Equivalent annual cost (EAC) (₹ 25,66,700/4.4873)	5,71,992
---	----------

**PV of cost of replacing the old machine in each of 4 years
with new machine**

Scenario	Year	Cash Flow (₹)	PV @ 15%	PV (₹)
Replace Immediately	0	(5,71,992)	1.00	(5,71,992)
	0	8,00,000	1.00	8,00,000
				2,28,008
Replace in one year	1	(5,71,992)	0.8696	(4,97,404)
	1	(2,00,000)	0.8696	(1,73,920)
	1	5,00,000	0.8696	4,34,800
				(2,36,524)
Replace in two years	1	(2,00,000)	0.8696	(1,73,920)
	2	(5,71,992)	0.7561	(4,32,483)
	2	(4,00,000)	0.7561	(3,02,440)
	2	3,00,000	0.7561	2,26,830
				(6,82,013)
Replace in three years	1	(2,00,000)	0.8696	(1,73,920)
	2	(4,00,000)	0.7561	(3,02,440)
	3	(5,71,992)	0.6575	(3,76,085)
	3	(6,00,000)	0.6575	(3,94,500)
	3	2,00,000	0.6575	1,31,500
				(11,15,445)
Replace in four years	1	(2,00,000)	0.8696	(1,73,920)
	2	(4,00,000)	0.7561	(3,02,440)
	3	(6,00,000)	0.6575	(3,94,500)
	4	(5,71,992)	0.5718	(3,27,065)
	4	(8,00,000)	0.5718	(4,57,440)
				(16,55,365)

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

Question – 52

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹ 2,50,000 on 31st March. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹

40,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,50,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 6,00,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows written down value method depreciation @ 10% but for tax purpose, straight line method depreciation is used considering that this is the only machine in the block of assets. A working capital of ₹ 50,000 will be needed and it will be released at the end of tenth year.

Given below are the expected sales and costs from both old and new machine:

	Old Machine	New Machine
Annual output	60,000 units	80,000 units
Selling price per unit	₹ 18	₹ 18
Annual operating hours	2,800	2,800
Material cost per unit	₹ 5	₹ 5
Labour cost per hour	₹ 50	₹ 75
Indirect cash cost per annum	₹ 1,00,000	₹ 1,75,000

From the above information, ANALYSE whether the old machine should be replaced or not if the opportunity cost of capital of the Company is 10%?

The Income tax rate is 30%. Further assume that book profit is treated as ordinary income for tax purpose.

Also ESTIMATE the internal rate of return of the replacement decision.

All calculations to be calculated to 3 decimal places.

(RTP May – 2024)

Solution:

Workings:

(i) Initial Cash Outflow:

	Amount (₹)
Cost of new machine	6,00,000
Less: Sale Price of existing machine	1,05,000
Net of Tax (₹ 1,50,000 × 0.70)	
	4,95,000

(ii) Terminal Cash Flows:**New Machine**

	Amount (₹)
Salvage value of Machine	35,000
Less: Depreciated WDV	35,000
{₹ 6,00,000 – (₹ 56,500 × 10 years)}	
Short Term Capital Gain (STCG)	Nil
Tax	Nil
Net Salvage Value (cash flows)	35,000

(iii) Computation of additional cash flows (yearly)

Particulars	Existing machine	New Machine	Incremental
(1)	(2)	(3)	(4) = (3) – (2)
Annual output	60,000 units	80,000 units	20,000 units
	₹	₹	₹
(A) Sales revenue @ ₹ 18 per unit	10,80,000	14,40,000	3,60,000
(B) Less: Cost of Operation			
Material @ ₹ 5 per unit	3,00,000	4,00,000	1,00,000
Labour			
Old = 2,800 × ₹ 50	1,40,000		70,000
New = 2,800 × ₹ 75		2,10,000	
Indirect cash cost	1,00,000	1,75,000	75,000
Total Cost (B)	5,40,000	7,85,000	2,45,000
Profit Before Tax and depreciation (PBTd) (A – B)	5,40,000	6,55,000	1,15,000
Less: Depreciation = $\left(\frac{6,00,000 - 35,000}{10} \right)$			56,500
Earning after depreciation before Tax			58,500
Less: Tax @30%			17,550
Earning after depreciation and Tax			40,950
Add: Depreciation			56,500
Net Cash inflow			97,450

Analysis: Since the Incremental Cash flow is positive, the old machine should be replaced.

Note: As mentioned in the question WDV of Machine is zero for tax purpose hence no depreciation shall be provided in existing machine.

(iv) Calculation of IRR**Computation of NPV @ 10%**

	Period	Cash flow (₹)	PVF @ 10%	PV (₹)
Incremental cash flows	1-10	97,450	6.144	5,98,733
Add: Release of Working Capital	10	50,000	0.386	19,300
Add: Terminal year cash	10	35,000	0.386	13,510
				6,31,543
Less: Initial cash outflow	0	4,95,000	1	4,95,000
Less: Working capital	0	50,000	1	50,000
			NPV	86,543

Since NPV computed in Part (i) is positive. Let us discount cash flows at higher rate say at 20%

	Period	Cash flow (₹)	PVF @ 20%	PV (₹)
Incremental cash flows	1-10	97,450	4.192	4,08,510
Add: Release of Working Capital	10	50,000	0.162	8,100
Add: Terminal year cash	10	35,000	0.162	5,670
				4,22,280
Less: Initial cash outflow	0	4,95,00	1	4,95,000
Less: Working capital	0	50,000	1	50,000
			NPV	(1,22,720)

Now we use interpolation formula:

$$10\% + \frac{86,543}{86,543 - (-1,22,720)} \times 10\%$$

$$10\% + \frac{86,543}{2,09,263} \times 10\%$$

$$\text{IRR} = 10\% + 4.14\% = 14.14\%$$

Summary of Results

		Decision
Incremental Cash Flow ₹	97,450	Accept
IRR	14.14% > Cost of Capital (10%)	Accept

Question – 53

Shiv Limited is thinking of replacing its existing machine by a new machine which would cost ₹ 60 lakhs. The company's current production is 80,000 units, and is expected to increase to 1,00,000 units, if the new machine is bought. The selling price of the product would remain unchanged at ₹ 200 per unit. The following is the cost of producing one unit of product using both the existing and new machine:

			Unit cost (₹)
	Existing Machine (80,000 units)	New Machine (1,00,000 units)	Difference
Materials	75.0	63.75	(11.25)
Wages & Salaries	51.25	37.50	(13.75)
Supervision	20.0	25.0	5.0
Repairs and Maintenance	11.25	7.50	(3.75)
Power and Fuel	15.50	14.25	(1.25)
Depreciation	0.25	5.0	4.75
Allocated Corporate Overheads	<u>10.0</u>	<u>12.50</u>	<u>2.50</u>
	<u>183.25</u>	<u>165.50</u>	<u>17.75</u>

The existing machine has an accounting book value of ₹ 1,00,000, and it has been fully depreciated for tax purpose. It is estimated that machine will be useful for 5 years. The supplier of the new machine has offered to accept the old machine for ₹2,50,000. However, the market price of old machine today is ₹ 1,50,000 and it is expected to be ₹ 35,000 after 5 years. The new machine has a life of 5 years and a salvage value of ₹ 2,50,000 at the end of its economic life. Assume corporate Income tax rate at 40%, and depreciation is charged on straight line basis for Income-tax purposes. Further assume that book profit is treated as ordinary income for tax purpose. The opportunity cost of capital of the Company is 15%.

Required:

- ESTIMATE net present value of the replacement decision.
- CALCULATE the internal rate of return of the replacement decision.
- Should Company go ahead with the replacement decision? ANALYSE.

Year (t)	1	2	3	4	5
PVIF _{0.15,t}	0.8696	0.7561	0.6575	0.5718	0.4972
PVIF _{0.20,t}	0.8333	0.6944	0.5787	0.4823	0.4019
PVIF _{0.25,t}	0.80	0.64	0.512	0.4096	0.3277
PVIF _{0.30,t}	0.7692	0.5917	0.4552	0.3501	0.2693

PVIF _{0.35,t}	0.7407	0.5487	0.4064	0.3011	0.2230
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(RTP Nov – 2018)

Solution:**(i) Net Cash Outlay of New Machine**

Purchase Price	₹ 60,00,000
Less: Exchange value of old machine	
$[2,50,000 - 0.4(2,50,000 - 0)]$	<u>1,50,000</u>
	<u>₹ 58,50,000</u>

Market Value of Old Machine: The old machine could be sold for ₹ 1,50,000 in the market. Since the exchange value is more than the market value, this option is not attractive. This opportunity will be lost whether the old machine is retained or replaced. Thus, on incremental basis, it has no impact.

Depreciation base: Old machine has been fully depreciated for tax purpose.

Thus, the depreciation base of the new machine will be its original cost i.e. ₹ 60,00,000.

Net Cash Flows: Unit cost includes depreciation and allocated overheads. Allocated overheads are allocated from corporate office therefore they are irrelevant. The depreciation tax shield may be computed separately. Excluding depreciation and allocated overheads, unit costs can be calculated. The company will obtain additional revenue from additional 20,000 units sold.

Thus, after-tax saving, excluding depreciation, tax shield, would be

$$\begin{aligned}
 &= \{100,000(200 - 148) - 80,000(200 - 173)\} \times (1 - 0.40) \\
 &= \{52,00,000 - 21,60,000\} \times 0.60 \\
 &= ₹ 18,24,000
 \end{aligned}$$

After adjusting depreciation tax shield and salvage value, net cash flows and net present value are estimated.

Calculation of Cash flows and Project Profitability

	₹ ('000)					
	0	1	2	3	4	5
1 After-tax savings -	-	1824	1824	1824	1824	1824
2 Depreciation (₹ 60,00,000 – 2,50,000)/5	-	1150	1150	1150	1150	1150
3 Tax shield on Depreciation (Depreciation × Tax rate)	-	460	460	460	460	460
4 Net cash flows from operations (1 + 3)*	-	2284	2284	2284	2284	2284
5 Initial cost	(5850)					
6 Net Salvage Value (2,50,000 – 35,000)	-	-	-	-	-	215
7 Net Cash Flows (4+5+6)	(5850)	2284	2284	2284	2284	2499
8 PVF at 15%	1.00	0.8696	0.7561	0.6575	0.5718	0.4972
9 PV	(5850)	1986.166	1726.932	1501.73	1305.99	1242.50
10 NPV	₹ 1913.32					

* Alternately Net Cash flows from operation can be calculated as follows:

Profit before depreciation and tax

$$= ₹ 1,00,000 (200 - 148) - 80,000 (200 - 173)$$

$$= ₹ 52,00,000 - 21,60,000$$

$$= ₹ 30,40,000$$

So profit after depreciation and tax is

$$₹ (30,40,000 - 11,50,000) \times (1 - .40)$$

$$= ₹ 11,34,000$$

So profit before depreciation and after tax is :

$$₹ 11,34,000 + ₹ 11,50,000 \text{ (Depreciation added back)} = ₹ 22,84,000$$

(ii)

	₹ ('000)					
	0	1	2	3	4	5
NCF	(5850)	2284	2284	2284	2284	2499
PVF at 20%	1.00	0.8333	0.6944	0.5787	0.4823	0.4019
PV	(5850)	1903.257	1586.01	1321.751	1101.57	1004.35
PV of benefits	6916.94					
PVF at 30%	1.00	0.7692	0.5917	0.4550	0.3501	0.2693
PV	(5850)	1756.85	1351.44	1039.22	799.63	672.98
PV of benefits	5620.12					

$$\text{IRR} = 20\% + 10\% \times \frac{1066.94}{1296.82} = 28.23\%$$

(iii) Advise: The Company should go ahead with replacement project, since it is positive NPV decision.

Question – 54

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹ 2,40,000 on 31st March 2021. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹ 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,00,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 4,50,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 7.5% is allowed taking that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old machine (₹)	New machine (₹)
Sales	8,10,000	8,10,000
Material cost	1,80,000	1,26,250
Labour cost	1,35,000	1,10,000
Variable overhead	56,250	47,500
Fixed overhead	90,000	97,500
Depreciation	24,000	41,500
PBT	3,24,750	3,87,250

Tax @ 30%	97,425	1,16,175
PAT	2,27,325	2,71,075

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386

(RTP Nov – 2021)

Solution:

Workings:

1. Calculation of Base for depreciation or Cost of New Machine

Particulars	(₹)
Purchase price of new machine	4,50,000
Less: Sale price of old machine	1,00,000
	3,50,000

2. Calculation of Profit before tax as per books

Particulars	Old machine	New machine	Difference
PBT as per books	3,24,750	3,87,250	62,500
Add: Depreciation as per books	24,000	41,500	17,500
Profit before tax and depreciation (PBTD)	3,48,750	4,28,750	80,000

Calculation of Incremental NPV

Year	PVF @ 10%	PBTD (₹)	Dep. @ 7.5% (₹)	PBT (₹)	Tax @ 30% (₹)	Cash Inflows (₹)	PV of Cash Inflows (₹)
	(1)	(2)	(3)	(4)	(5) = (4) × 0.30	(6) = (4) – (5) + (3)	(7) = (6) × (1)
1	0.909	80,000.00	26,250.00	53,750.00	16,125.00	63,875.00	58,062.38
2	0.826	80,000.00	24,281.25	55,718.75	16,715.63	63,284.38	52,272.89
3	0.751	80,000.00	22,460.16	57,539.84	17,261.95	62,738.05	47,116.27
4	0.683	80,000.00	20,775.64	59,224.36	17,767.31	62,232.69	42,504.93

5	0.621	80,000.00	19,217.47	60,782.53	18,234.76	61,765.24	38,356.21
6	0.564	80,000.00	17,776.16	62,223.84	18,667.15	61,332.85	34,591.73
7	0.513	80,000.00	16,442.95	63,557.05	19,067.12	60,932.88	31,258.57
8	0.467	80,000.00	15,209.73	64,790.27	19,437.08	60,562.92	28,282.88
9	0.424	80,000.00	14,069.00	65,931.00	19,779.30	60,220.70	25,533.58
10	0.386	80,000.00	13,013.82	66,986.18	20,095.85	59,904.15	23,123.00
							3,81,102.44
Add: PV of Salvage value of new machine (35,000 × 0.386)							13,510.00
Total PV of incremental cash inflows							3,94,612.44
Less: Cost of new machine							3,50,000.00
Incremental Net Present Value							44,612.44

Analysis: Since the Incremental NPV is positive, the old machine should be replaced.

Question – 55

An existing company has a machine which has been in operation for two years, its estimated remaining useful life is 4 years with no residual value in the end. Its current market value is ₹ 3 lakhs. The management is considering a proposal to purchase an improved model of a machine gives increase output. The details are as under:

Particulars	Existing Machine	New Machine
Purchase Price	₹ 6,00,000	₹10,00,000
Estimated Life	6 years	4 years
Residual Value	0	0
Annual Operating days	300	300
Operating hours per day	6	6
Selling price per unit	₹10	₹10
Material cost per unit	₹2	₹2
Output per hour in units	20	40
Labour cost per hour	₹20	₹30
Fixed overhead per annum excluding depreciation	₹1,00,000	₹1,00,000
Working Capital	₹1,00,000	₹1,00,000
Income-tax rate	30%	30%

Assuming that - cost of capital is 10% and the company uses written down value of depreciation @ 20% and it has several machines in 20% block.

Advice the management on the Replacement of Machine as per the NPV method.

The discounting factors table given below:

Discounting Factors	Year 1	Year 2	Year 3	Year 4
10%	0.909	0.826	0.751	0.683

(Exam July – 2021)

Solution:**(i) Calculation of Net Initial Cash Outflows:**

Particulars	₹
Purchase Price of new machine	10,00,000
Add: Net Working Capital	1,00,000
Less: Sale proceeds of existing machine	3,00,000
Net initial cash outflows	8,00,000

(ii) Calculation of annual Profit Before Tax and depreciation

Particulars	Existing machine	New Machine	Differential
(1)	(2)	(3)	(4) = (3) – (2)
Annual output	36,000 units	72,000 units	36,000 units
	₹	₹	₹
(A) Sales revenue @ ₹ 10 per unit	3,60,000	7,20,000	3,60,000
(B) Cost of Operation Material @ ₹ 2 per unit	72,000	1,44,000	72,000
Labour Old = 1,800 × ₹ 20 New = 1,800 × ₹ 30	36,000	54,000	18,000
Fixed overhead excluding depreciation	1,00,000	60,000	(40,000)
Total Cost (B)	2,08,000	2,58,000	50,000
Profit Before Tax and depreciation (PBTD) (A – B)	1,52,000	4,62,000	3,10,000

(iii) Calculation of Net Present value on replacement of machine

Year	PBTD	Depreciation @ 20% WDV	PBT	Tax @ 30%	PAT	Net cash flow	PVF @ 10%	PV
(1)	(2)	(3)	(4 = 2-3)	(5)	(6 = 4-5)	(7 = 6 + 3)	(8)	(9 = 7 × 8)
1	3,10,000	1,40,000	1,70,000	51,000	1,19,000	2,59,000	0.909	2,35,431.000

2	3,10,000	1,12,000	1,98,000	59,400	1,38,600	2,50,600	0.826	2,06,995.600
3	3,10,000	89,600	2,20,400	66,120	1,54,280	2,43,880	0.751	1,83,153.880
4	3,10,000	71,680	2,38,320	71,496	1,66,824	2,38,504	0.683	1,62,898.232
								7,88,478.712
Add: Release of net working capital at year end 4 (1,00,000 × 0.683)								68,300.000
Less: Initial Cash Outflow								8,00,000.000
NPV								56,778.712

Advice: Since the incremental NPV is positive, existing machine should be replaced.

Working Notes:

1. Calculation of Annual Output

Annual output = (Annual operating days × Operating hours per day) × output per hour

Existing machine = $(300 \times 6) \times 20 = 1,800 \times 20 = 36,000$ units

New machine = $(300 \times 6) \times 40 = 1,800 \times 40 = 72,000$ units

2. Base for incremental depreciation

Particulars	₹
WDV of Existing Machine	
Purchase price of existing machine	6,00,000
Less: Depreciation for year 1	1,20,000
Depreciation for Year 2	<u>96,000</u>
WDV of Existing Machine (i)	3,84,000
Depreciation base of New Machine	
Purchase price of new machine	10,00,000
Add: WDV of existing machine	3,84,000
Less: Sales value of existing machine	3,00,000
Depreciation base of New Machine (ii)	10,84,000
Base for incremental depreciation [(ii) – (i)]	7,00,000

(Note: The above solution have been done based on incremental approach)

Alternatively, solution can be done based on Total Approach as below:

(i) Calculation of depreciation:

Existing Machine						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Opening balance	6,00,000	4,80,000	3,84,000	3,07,200	2,45,760	1,96,608.00
Less: Depreciation @ 20%	1,20,000	96,000	76,800	61,440	49,152	39,321.60
WDV	4,80,000	3,84,000	3,07,200	2,45,760	1,96,608	1,57,286.40

New Machine				
	Year 1	Year 2	Year 3	Year 4
Opening balance	10,84,000*	8,67,200	6,93,760	5,55,008.00
Less: Depreciation @ 20%	2,16,800	1,73,440	1,38,752	1,11,001.60
WDV	8,67,200	6,93,760	5,55,008	4,44,006.40

* As the company has several machines in 20% block, the value of Existing Machine from the block calculated as below shall be added to the new machine of ₹ 10,00,000:

WDV of existing machine at the beginning of the year ₹ 3,84,000

Less: Sale Value of Machine ₹ 3,00,000

WDV of existing machine in the block ₹ 84,000

Therefore, opening balance for depreciation of block = ₹ 10,00,000 + ₹ 84,000 = ₹ 10,84,000

(ii) Calculation of annual cash inflows from operation:

Particulars	EXISTING MACHINE			
	Year 3	Year 4	Year 5	Year 6
Annual output (300 operating days × 6 operating hours × 20 output per hour)	36,000 units	36,000 units	36,000 units	36,000 units
	₹	₹	₹	₹
(A) Sales revenue @ ₹ 10 per unit	3,60,000.00	3,60,000.00	3,60,000.00	3,60,000.00
(B) Less: Cost of Operation Material @ ₹ 2 per unit	72,000.00	72,000.00	72,000.00	72,000.00

Labour @ ₹ 20 per hour for (300 × 6) hours	36,000.00	36,000.00	36,000.00	36,000.00
Fixed overhead	1,00,000.00	1,00,000.00	1,00,000.00	1,00,000.00
Depreciation	76,800.00	61,440.00	49,152.00	39,321.60
Total Cost (B)	2,84,800.00	2,69,440.00	2,57,152.00	2,47,321.60
Profit Before Tax (A – B)	75,200.00	90,560.00	1,02,848.00	1,12,678.40
Less: Tax @ 30%	22,560.00	27,168.00	30,854.40	33,803.52
Profit After Tax	52,640.00	63,392.00	71,993.60	78,874.88
Add: Depreciation	76,800.00	61,440.00	49,152.00	39,321.60
Add: Release of Working Capital				1,00,000.00
Annual Cash Inflows	1,29,440.00	1,24,832.00	1,21,145.60	2,18,196.48

Particulars	NEW MACHINE			
	Year 1	Year 2	Year 3	Year 4
Annual output (300 operating days × 6 operating hours × 40 output per hour)	72,000 units	72,000 units	72,000 units	72,000 units
	₹	₹	₹	₹
(A) Sales revenue @ ₹ 10 per unit	7,20,000.00	7,20,000.00	7,20,000.00	7,20,000.00
(B) Less: Cost of Operation				
Material @ ₹ 2 per unit	1,44,000.00	1,44,000.00	1,44,000.00	1,44,000.00
Labour @ ₹ 30 per hour for (300 × 6) hours	54,000.00	54,000.00	54,000.00	54,000.00
Fixed overhead	60,000.00	60,000.00	60,000.00	60,000.00
Depreciation	2,16,800.00	1,73,440.00	1,38,752.00	1,11,001.60
Total Cost (B)	4,74,800.00	4,31,440.00	3,96,752.00	3,69,001.60
Profit Before Tax (A – B)	2,45,200.00	2,88,560.00	3,23,248.00	3,50,998.40
Less: Tax @ 30%	73,560.00	86,568.00	96,974.40	1,05,299.52
Profit After Tax	1,71,640.00	2,01,992.00	2,26,273.60	2,45,698.88
Add: Depreciation	2,16,800.00	1,73,440.00	1,38,752.00	1,11,001.60
Add: Release of Working Capital				2,00,000.00
Annual Cash Inflows	3,88,440.00	3,75,432.00	3,65,025.60	5,56,700.48

(iii) Calculation of Incremental Annual Cash Flow:

Particulars	Year 1 (₹)	Year 2 (₹)	Year 3 (₹)	Year 4 (₹)
Existing Machine (A)	1,29,440.00	1,24,832.00	1,21,145.60	2,18,196.48
New Machine (B)	3,88,440.00	3,75,432.00	3,65,025.60	5,56,700.48
Incremental Annual Cash Flow (B – A)	2,59,000.00	2,50,600.00	2,43,880.00	3,38,504.00

(iv) Calculation of Net Present Value on replacement of machine:

Year	Incremental Annual Cash Flow (₹) (A)	Discounting factor @ 10% (B)	Present Value of Incremental Annual Cash Flow (₹) (A × B)
1	2,59,000.00	0.909	2,35,431.000
2	2,50,600.00	0.826	2,06,995.600
3	2,43,880.00	0.751	1,83,153.880
4	3,38,504.00	0.683	2,31,198.232
Total Incremental Inflows			8,56,778.712
Less: Net Initial Cash Outflows (Working note)			8,00,000.000
Incremental NPV			56,778.712

Advice: Since the incremental NPV is positive, existing machine should be replaced.

Working Note:**Calculation of Net Initial Cash Outflows:**

Particulars	₹
Cost of new machine	10,00,000
Less: Sale proceeds of existing machine	3,00,000
Add: incremental working capital required (₹ 2,00,000 – ₹ 1,00,000)	1,00,000
Net initial cash outflows	8,00,000

Question – 56

Four years ago, Z Ltd. had purchased a machine of ₹ 4,80,000 having estimated useful life of 8 years with zero salvage value. Depreciation is charged using SLM method over the useful life. The company want to replace this machine with a new machine. Details of new machine are as below:

- Cost of new machine is ₹ 12,00,000, Vendor of this machine is agreed to take old machine at a value of ₹ 2,40,000. Cost of dismantling and removal of old machine will be ₹ 40,000. 80% of net purchase price will be paid on spot and remaining will be paid at the end of one year.
- Depreciation will be charged @ 20% p.a. under WDV method.
- Estimated useful life of new machine is four years and it has salvage value of ₹ 1,00,000 at the end of year four.
- Incremental annual sales revenue is ₹ 12,25,000.
- Contribution margin is 50%.
- Incremental indirect cost (excluding depreciation) is ₹ 1,18,750 per year.
- Additional working capital of ₹ 2,50,000 is required at the beginning of year and ₹ 3,00,000 at the beginning of year three. Working capital at the end of year four will be nil.
- Tax rate is 30%.
- Ignore tax on capital gain.

Z Ltd. will not make any additional investment, if it yields less than 12%

Advice, whether existing machine should be replaced or not.

Year	1	2	3	4	5
PVIF _{0.12,t}	0.893	0.797	0.712	0.636	0.567

(Exam, May – 2023)

Solution:

Working Notes:

(i) Calculation of Net Initial Cash Outflow

Particulars	₹
Cost of New Machine	12,00,000
Less: Sale proceeds of existing machine	2,00,000
Net Purchase Price	10,00,000
Paid in year 0	8,00,000
Paid in year 1	2,00,000

(ii) Calculation of Additional Depreciation

Year	1	2	3	4
	₹	₹	₹	₹
Opening WDV of machine	10,00,000	8,00,000	6,40,000	5,12,000
Depreciation on new machine @ 20%	2,00,000	1,60,000	1,28,000	1,02,400
Closing WDV	8,00,000	6,40,000	5,12,000	4,09,600
Depreciation on old machine (4,80,000/8)	60,000	60,000	60,000	60,000
Incremental depreciation	1,40,000	1,00,000	68,000	42,400

(iii) Calculation of Annual Profit before Depreciation and Tax (PBDT)

Particulars	Incremental Values (₹)
Sales	12,25,000
Contribution	6,12,500
Less: Indirect Cost	<u>1,18,750</u>
Profit before Depreciation and Tax (PBDT)	4,93,750

Calculation of Incremental NPV

Year	PVF @ 12%	PBTD (₹)	Incremental Depreciation (₹)	PBT (₹)	Tax @ 30% (₹)	Cash Inflows (₹)	PV of Cash Inflows (₹)
	(1)	(2)	(3)	(4)	(5) = (4) × 0.30	(6) = (4) – (5) + (3)	(7) = (6) × (1)
1	0.893	4,93,750	1,40,000	3,53,750	106,125	3,87,625	3,46,149.125
2	0.797	4,93,750	1,00,000	3,93,750	1,18,125	3,75,625	2,99,373.125
3	0.712	4,93,750	68,000	4,25,750	1,27,725	3,66,025	2,60,609.800
4	0.636	4,93,750	42,400	4,51,350	1,35,405	3,58,345	2,27,907.420
*							11,34,039.470
Add: PV of Salvage (₹ 1,00,000 × 0.636)							63,600
Less: Initial Cash Outflow - Year 0							8,00,000
Year 1 (₹ 2,00,000 × 0.893)							1,78,600

Less: Working Capital - Year 0	2,50,000
Year 2 (₹ 3,00,000 × 0.797)	2,39,100
Add: Working Capital released - Year 4 (₹ 5,50,000 × 0.636)	3,49,800
Incremental Net Present Value	79,739.470

Since the incremental NPV is positive, existing machine should be replaced.

Alternative Presentation

Computation of Outflow for new Machine:

	₹
Cost of new machine	<u>12,00,000</u>
Replaced cost of old machine	2,40,000
Cost of removal	<u>40,000</u>
Net Purchase price	10,00,000
Outflow at year 0	8,00,000
Outflow at year 1	2,00,000

Computation of additional depreciation

Year	1	2	3	4
	₹	₹	₹	₹
Opening WDV of machine	10,00,000	8,00,000	6,40,000	5,12,000
Depreciation on new machine @ 20%	2,00,000	1,60,000	1,28,000	1,02,400
Closing WDV	8,00,000	6,40,000	5,12,000	4,09,600
Depreciation on old machine (4,80,000/8)	60,000	60,000	60,000	60,000
Incremental depreciation	1,40,000	1,00,000	68,000	42,400

Computation of NPV

	Year	0	1	2	3	4
			₹	₹	₹	₹
1.	Increase in sales revenue		12,25,000	12,25,000	12,25,000	12,25,000
2.	Contribution		6,12,500	6,12,500	6,12,500	6,12,500
3.	Increase in fixed cost		1,18,750	1,18,750	1,18,750	1,18,750
4	Incremental Depreciation		1,40,000	1,00,000	68,000	42,400
5	Net profit before tax [1-(2+3+4)]		3,53,750	3,93,750	4,25,750	4,51,350
6	Net Profit after tax (5 × 70%)		2,47,625	2,75,625	2,98,025	3,15,945
7	Add: Incremental		1,40,000	1,00,000	68,000	42,400

	depreciation					
8	Net Annual cash inflows (6 + 7)		3,87,625	3,75,625	3,66,025	3,58,345
9	Release of salvage value					1,00,000
10	(investment)/disinvestment in working capital	(2,50,000)		(3,00,000)		5,50,000
11	Initial cost	(8,00,000)	(2,00,000)			
12	Total net cash flows	(10,50,000)	1,87,625.0	75,625	3,66,025	10,08,345
13	Discounting Factor	1	0.893	0.797	0.712	0.636
14	Discounted cash flows (12 × 13)	(10,50,000)	1,67,549.125	60,273.125	2,60,609.800	6,41,307.420

NPV = (1,67,549 + 60,273 + 2,60,610 + 6,41,307) - 10,50,000 = ₹ **79,739**
 Since the NPV is positive, existing machine should be replaced.

Question – 57

HCP Ltd. is a holding manufacturer of railway parts for passenger coaches and freight wagons. Due to high wastage of material and quality issue in production, the General Manager of the company is considering the replacement of machine A with a new CNC machine B. Machine A has a book value of ₹ 4,80,000 and remaining economic life is 6 years. It could be sold now at ₹ 1,80,000 and zero salvage value at the end of sixth year. The purchase price of Machine B is ₹ 24,00,000 with economic life of 6 years. It will require ₹ 1,40,000 for installation and ₹ 60,000 for testing. Subsidy of 15% on the purchase price of the machine B will be received from Government at the end of 1st year. Salvage value at the end of sixth year will be ₹ 3,20,000.

The General Manager estimates that the annual savings due to installation of machine B include a reduction of three skilled workers with annual salaries of ₹ 1,68,000 each, ₹ 4,80,000 from reduced wastage of materials and defectives and ₹ 3,50,000 from loss in sales due to delay in execution of purchase orders. Operation of Machine B will require the services of a trained technician with annual salary of ₹ 3,90,000 and annual operation and maintenance cost will increase by ₹ 1,54,000. The company's tax rate is 30% and its required rate of return is 14%. The company follows straight line method of depreciation. Ignore tax saving on loss due to sale of existing machine.

The present value factors at 14% are:

Years	0	1	2	3	4	5	6
PV Factors	1	0.877	0.769	0.675	0.592	0.519	0.456

Required:

- (i) Calculate the Net Present Value and Profitability Index and advise the company for replacement decision.
- (ii) Also calculate the discounted pay-back period.

(Exam, May – 2024)

(3) RESIDUAL

Question – 58

XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require ₹ 270 lakhs capital expenditure on new machinery. They expect the capital investment to provide annual cash flows of ₹ 42 lakhs indefinitely which is net of all tax adjustments. The discount rate which it applies to such investment decisions is 14% net.

The directors of the company believe that the current capital structure fails to take advantage of tax benefits of debt and propose to finance the new project with undated perpetual debt secured on the company's assets. The company intends to issue sufficient debt to cover the cost of capital expenditure and the after tax cost of issue.

The current annual gross rate of interest required by the market on corporate undated debt of similar risk is 10%. The after tax costs of issue are expected to be ₹ 10 lakhs. Company's tax rate is 30%.

You are REQUIRED to:

- (i) Calculate the adjusted present value of the investment,
- (ii) Calculate the adjusted discount rate and
- (iii) Explain the circumstances under which this adjusted discount rate may be used to evaluate future investments.

(Study Material ICAI Illus – 19)

Solution:

(i) Calculation of Adjusted Present Value of Investment (APV)

Adjusted PV

= Base Case PV + PV of financing decisions associated with the project

Base Case NPV for the project:

$$\begin{aligned}(-) ₹ 270 \text{ lakhs} + (₹ 42 \text{ lakhs} / 0.14) &= (-) ₹ 270 \text{ lakhs} + ₹ 300 \text{ lakhs} \\ &= ₹ 30\end{aligned}$$

Issue costs = ₹ 10 lakhs

$$\begin{aligned}\text{Thus, the amount to be raised} &= ₹ 270 \text{ lakhs} + ₹ 10 \text{ lakhs} \\ &= ₹ 280 \text{ lakhs}\end{aligned}$$

$$\begin{aligned}\text{Annual tax relief on interest payment} &= ₹ 280 \times 0.1 \times 0.3 \\ &= ₹ 8.4 \text{ lakhs in perpetuity}\end{aligned}$$

$$\begin{aligned}\text{The value of tax relief in perpetuity} &= ₹ 8.4 \text{ lakhs} / 0.1 \\ &= ₹ 84 \text{ lakhs}\end{aligned}$$

Therefore, APV

$$\begin{aligned}&= \text{Base case PV} - \text{Issue Costs} + \text{PV of Tax Relief on debt interest} \\ &= ₹ 30 \text{ lakhs} - ₹ 10 \text{ lakhs} + 84 \text{ lakhs} = ₹ 104 \text{ lakhs}\end{aligned}$$

(ii) Calculation of Adjusted Discount Rate (ADR)

Annual Income / Savings required to allow an NPV to zero

Let the annual income be x.

$$(-) ₹ 280 \text{ lakhs} + (\text{Annual Income} / 0.14) = (-) ₹ 104 \text{ lakhs}$$

$$\text{Annual Income} / 0.14 = (-) ₹ 104 + ₹ 280 \text{ lakhs}$$

$$\text{Therefore, Annual income} = ₹ 176 \times 0.14 = ₹ 24.64 \text{ lakhs}$$

$$\begin{aligned}\text{Adjusted discount rate} &= (₹ 24.64 \text{ lakhs} / ₹ 280 \text{ lakhs}) \times 100 \\ &= 8.8\%\end{aligned}$$

(iii) Useable circumstances

This ADR may be used to evaluate future investments only if the business risk of the new venture is identical to the one being evaluated here and the project is to be financed by the same method on the same terms. The effect on the company's cost of capital of introducing debt into the capital structure cannot be ignored.

Question – 59

Elite Cooker Company is evaluating three investment situations: (1) Produce a new line of aluminium skillets, (2) Expand its existing cooker line to include several new sizes, and (3) Develop a new, higher-quality line of cookers. If only the project in question is undertaken, the expected present values and the amounts of investment required are:

Project	Investment Required	Present Value of Future Cash-Flows
	₹	₹
1	2,00,000	2,90,000
2	1,15,000	1,85,000
3	2,70,000	4,00,000

If projects 1 and 2 are jointly undertaken, there will be no economies; the investments required and present values will simply be the sum of the parts. With projects 1 and 3, economies are possible in investment because one of the machines acquired can be used in both production processes. The total investment required for projects 1 and 3 combined is ₹ 4,40,000. If projects 2 and 3 are undertaken, there are economies to be achieved in marketing and producing the products but not in investment. The expected present value of future cash flows for projects 2 and 3 is ₹ 6,20,000. If all three projects are undertaken simultaneously, the economies noted will still hold. However, a ₹ 1,25,000 extension on the plant will be necessary, as space is not available for all three projects. CALCULATE NPV of the projects and STATE which project or projects should be chosen?

(Study Material ICAI TYK – 04)

Solution:**Calculation of NPV**

Project	Investment Required	Present value of Future Cash Flows	Net Present value
---------	---------------------	------------------------------------	-------------------

	₹	₹	₹
1	2,00,000	2,90,000	90,000
2	1,15,000	1,85,000	70,000
3	2,70,000	4,00,000	1,30,000
1 and 2	3,15,000	4,75,000	1,60,000
1 and 3	4,40,000	6,90,000	2,50,000
2 and 3	3,85,000	6,20,000	2,35,000
1, 2 and 3 (Refer Working Note)	6,80,000*	9,10,000	2,30,000

Working Note:

- (i) Total Investment required if all the three projects are undertaken simultaneously:

	(₹)
Project 1 & 3	4,40,000
Project 2	1,15,000
Plant extension cost	1,25,000
Total	6,80,000

- (ii) Total of Present value of Cash flows if all the three projects are undertaken simultaneously:

	(₹)
Project 2 & 3	6,20,000
Project 1	2,90,000
Total	9,10,000

Projects 1 and 3 should be chosen, as they provide the highest net present value.

Question – 60

A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing process to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of ₹ 150 lakh per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of ₹ 90 lakh before the processing operation starts. This compensation is not allowed as deduction for tax purposes.

The machine required for carrying out the processing will cost ₹ 600 lakh. At the end of the 4th year, the machine can be sold for ₹ 60 lakh and the cost of dismantling and removal will be ₹ 45 lakh.

Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under:

(₹ in lakh)

Year	1	2	3	4
Sales	966	966	1,254	1,254
Material Consumption	90	120	255	255
Wages	225	225	255	300
Other Expenses	120	135	162	210
Factory Overheads	165	180	330	435
Depreciation (as per income tax rules)	150	114	84	63

Initial stock of materials required before commencement of the processing operations is ₹ 60 lakh at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be ₹ 165 lakh and the stocks at the end of year 4 will be nil. The storage of materials will utilise space which would otherwise have been rented out for ₹ 30 lakh per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of ₹ 45 lakh in the year - 1 and ₹ 30 lakh in the year - 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of ₹ 90 lakh per annum payable on this venture. The company's tax rate is 30%.

Consider cost of capital @ 14%, the present value factors of which is given below for four years:

Year	1	2	3	4
PV Factor @ 14%	0.877	0.769	0.674	0.592

ADVISE the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

(Study Material ICAI TYK – 10)

Solution:

Statement of Operating Profit from processing of waste

(₹ in lakh)

Year	1	2	3	4
Sales (A)	966	966	1,254	1,254
Material consumption	90	120	255	255
Wages	180	195	255	300
Other expenses	120	135	162	210
Factory overheads (insurance only)	90	90	90	90
Depreciation (as per income tax rules)	150	114	84	63
Total cost (B)	630	654	846	918
Profit {(C)=(A) - (B)}	336	312	408	336
Less: Tax (30%)	100.8	93.6	122.4	100.8
Profit after Tax (PAT)	235.2	218.4	285.6	235.2
Less: Loss of rent on storage space (opportunity cost)	30	30	30	30
PAT after opportunity cost	205.2	188.4	255.6	205.2

Statement of Incremental Cash Flows

(₹ in lakh)

Year	0	1	2	3	4
Cost of Machine	(600)				
Material stock	(60)	(105)	-	-	165
Compensation for contract	(90)	-	-	-	-
Contract payment saved	-	150	150	150	150
Tax on contract payment	-	(45)	(45)	(45)	(45)
Incremental profit	-	336	312	408	336
Depreciation added back	-	150	114	84	63

Tax on profits	-	(100.8)	(93.6)	(122.4)	(100.8)
Profit on sale of machinery (net)	-	-	-	-	15
Total incremental cash flows	(750)	385.2	437.4	474.6	583.2
Present value factor	1	0.877	0.769	0.674	0.592
Present value of cash flows	(750)	337.82	336.36	319.88	345.25
Net present value	589.32				

Advice: Since the net present value of cash flows is ₹ 589.32 lakh which is positive the management should install the machine for processing the waste.

Notes:

1. Material stock increases are taken in cash flows.
2. Idle time wages have also been considered.
3. Apportioned factory overheads are not relevant only insurance charges of this project are relevant.
4. Sale of machinery - Net income after deducting removal expenses taken. Tax on Capital gains is ignored.
5. Saving in contract payment and income tax thereon is considered in the cash flows.

Question – 61

Manoranjana Ltd is a News broadcasting channel having its broadcasting Centre in Mumbai. There are total 200 employees in the organization including top management. As a part of employee benefit expenses, the company serves tea or coffee to its employees, which is outsourced from a third-party. The company offers tea or coffee three times a day to each of its employees. 120 employees prefer tea all three times, 40 employees prefer coffee all three times and remaining prefer tea only once in a day. The third-party charges ₹ 10 for each cup of tea and ₹ 15 for each cup of coffee. The company works for 200 days in a year.

Looking at the substantial amount of expenditure on tea and coffee, the finance department has proposed to the management an installation of a master tea and coffee vending machine which will cost ₹ 10,00,000 with a useful life of five years. Upon purchasing the machine, the company will have to enter into an annual maintenance contract with the vendor, which will require a payment of ₹ 75,000 every year. The machine would require electricity consumption of 500 units p.m. and current incremental cost of electricity for the company is ₹ 12 per unit. Apart from these running costs, the company will have to incur the following consumables expenditure also:

- (1) Packets of Coffee beans at a cost of ₹ 90 per packet.
- (2) Packet of tea powder at a cost of ₹ 70 per packet.
- (3) Sugar at a cost of ₹ 50 per Kg.
- (4) Milk at a cost of ₹ 50 per litre.
- (5) Paper cup at a cost of 20 paise per cup.

Each packet of coffee beans would produce 200 cups of coffee and same goes for tea powder packet. Each cup of tea or coffee would consist of 10g of sugar on an average and 100 ml of milk.

The company anticipate that due to ready availability of tea and coffee through vending machines its employees would end up consuming more tea and coffee.

It estimates that the consumption will increase by on an average 20% for all class of employees. Also, the paper cups consumption will be 10% more than the actual cups served due to leakages in them.

The company is in the 25% tax bracket and has a current cost of capital at 12% per annum. Straight line method of depreciation is allowed for the purpose of taxation. You as a financial consultant is required to ADVISE on the feasibility of acquiring the vending machine.

PV factors @ 12%:

Year	1	2	3	4	5
PVF	0.8929	0.7972	0.7118	0.6355	0.5674

(Study Material ICAI TYK – 14)

Solution:**A. Computation of CFAT (Year 1 to 5)**

Particulars		Amount (₹)
(a) Savings in existing Tea & Coffee charges	$(120 \times 10 \times 3) + (40 \times 15 \times 3) + (40 \times 10 \times 1) \times 200 \text{ days}$	11,60,000
(b) AMC of machine		(75,000)
(c) Electricity charges	$500 \times 12 \times 12$	(72,000)
(d) Coffee Beans	(W.N.) 144×90	(12,960)
(e) Tea Powder	(W.N.) 480×70	(33,600)
(f) Sugar	(W.N.) 1248×50	(62,400)
(g) Milk	(W.N.) 12480×50	(6,24,000)
(h) Paper Cup	(W.N.) $1,37,280 \times 0.2$	(27,456)
(i) Depreciation	$10,00,000/5$	(2,00,000)
Profit before Tax		52,584
(-) Tax @ 25%		(13,146)
Profit after Tax		39,438
Depreciation		2,00,000
CFAT		2,39,438

B. Computation of NPV

Year	Particulars	CF	PVF @ 12%	PV
0	Cost of Machine	(10,00,000)	1	(10,00,000)
1-5	CFAT	2,39,438	3.6048	8,63,126
Net Present Value				(1,36,874)

Since NPV of the machine is negative, it should not be purchased.

Working Note:

Computation of Qty of consumable

$$\begin{aligned} \text{No. of Tea Cups} &= [(120 \times 3 \times 200 \text{ days}) + (40 \times 1 \times 200 \text{ days}) \times 1.2 \\ &= 96,000 \end{aligned}$$

$$\text{No. of Coffee cups} = 40 \times 3 \times 200 \text{ days} \times 1.2 = 28,800$$

$$\text{No. of Coffee beans packet} = \frac{28,800}{200} = 144$$

$$\text{No. of Tea powder packets} = \frac{96,000}{200} = 480$$

$$\text{Qty of Sugar} = \frac{(96,000 + 28,800)6,000}{1,000 \text{ g}} = 1,248 \text{ kgs}$$

$$\text{Qty of Milk} = \frac{(96,000 + 28,800)6,000}{1,000 \text{ ml}} = 12,480 \text{ liters}$$

$$\text{No. of Paper Cups} = (96,000 + 28,800) \times 1.1 = 1,37,280$$

Question – 62

Superb Ltd. constructs customized parts for satellites to be launched by USA and Canada. The parts are constructed in eight locations (including the central headquarter) around the world. The Finance Director, Ms. Kuthrapali, chooses to implement video conferencing to speed up the budget process and save travel costs. She finds that, in earlier years, the company sent two officers from each location to the central headquarter to discuss the budget twice a year. The average travel cost per person, including air fare, hotels and meals, is ₹ 27,000 per trip. The cost of using video conferencing is ₹ 8,25,000 to set up a system at each location plus ₹ 300 per hour average cost of telephone time to transmit signals. A total 48 hours of transmission time will be needed to complete the budget each year. The company depreciates this type of equipment over five years by using straight line method. An alternative approach is to travel to local rented video conferencing facilities, which can be rented for ₹ 1,500 per hour plus ₹ 400 per hour average cost for telephone charges. You are Senior Officer of Finance Department. You have been asked by Ms. Kuthrapali to EVALUATE the proposal and SUGGEST if it would be worthwhile for the company to implement video conferencing.

(MTP Nov – 2021)**Solution:****Option I : Cost of travel, in case Video Conferencing facility is not provided**

$$\text{Total Trip} = \text{No. of Locations} \times \text{No. of Persons} \times \text{No. of Trips per Person} = 7 \times 2 \times 2 = 28 \text{ Trips}$$

$$\text{Total Travel Cost (including air fare, hotel accommodation and meals) (28 trips} \\ \times \text{₹ 27,000 per trip)} = \text{₹ 7,56,000}$$

Option II : Video Conferencing Facility is provided by Installation of Own Equipment at Different Locations

Cost of Equipment at each location ($\text{₹ } 8,25,000 \times 8 \text{ locations}$) = ₹ 66,00,000

Economic life of Machines (5 years). Annual depreciation ($66,00,000/5$)
= ₹ 13,20,000

Annual transmission cost (48 hrs. transmission $\times 8 \text{ locations} \times \text{₹ } 300 \text{ per hour}$)
= ₹ 1,15,200

Annual cost of operation ($13,20,000 + 1,15,200$) = ₹ 14,35,200

Option III : Engaging Video Conferencing Facility on Rental Basis

Rental cost (48 hrs. $\times 8 \text{ location} \times \text{₹ } 1,500 \text{ per hr}$) = ₹ 5,76,000

Telephone cost (48 hrs. $\times 8 \text{ locations} \times \text{₹ } 400 \text{ per hr.}$) = ₹ 1,53,600

Total rental cost of equipment ($5,76,000 + 1,53,600$) = ₹ 7,29,600

Analysis: The annual cash outflow is minimum, if video conferencing facility is engaged on rental basis. Therefore, Option III is suggested.

Question – 63

A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing process to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of ₹ 150 lakh per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of ₹ 90 lakh before the processing operation starts. This compensation is not allowed as deduction for tax purposes.

The machine required for carrying out the processing will cost ₹ 600 lakh to be financed by a loan repayable in 4 equal installments commencing from end of the year 1. The interest rate is 14% per annum. At the end of the 4th year, the machine can be sold for ₹ 60 lakh and the cost of dismantling and removal will be ₹ 45 lakh.

Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under:

(₹ in lakh)

Year	1	2	3	4
Sales	966	966	1,254	1,254
Material Consumption	90	120	255	255
Wages	225	225	255	300
Other expenses	120	135	162	210
Factory overheads	165	180	330	435
Depreciation (as per income tax rules)	150	114	84	63

Initial stock of materials required before commencement of the processing operations is ₹ 60 lakh at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be ₹ 165 lakh and the stocks at the end of year 4 will be nil. The storage of materials will utilize space which would otherwise have been rented out for ₹ 30 lakh per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of ₹ 45 lakh in the year - 1 and ₹ 30 lakh in the year - 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of ₹ 90 lakh per annum payable on this venture. The company's tax rate is 30%.

Present value factors for four years are as under:

Year	1	2	3	4
Pv factor @ 14 %	0.877	0.769	0.674	0.592

ADVISE the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

(RTP Nov – 2020)

Solution:**Statement of Operating Profit from processing of waste** (₹ in lakh)

Year	1	2	3	4
Sales : (A)	966	966	1,254	1,254
Material consumption	90	120	255	255
Wages	180	195	255	300
Other expenses	120	135	162	210
Factory overheads (insurance only)	90	90	90	90
Loss of rent on storage space	30	30	30	30

(opportunity cost)				
Interest @14%	84	63	42	21
Depreciation (as per income tax rules)	150	114	84	63
Total cost: (B)	744	747	918	969
Profit (C)=(A)-(B)	222	219	336	285
Tax (30%)	66.6	65.7	100.8	85.5
Profit after Tax (PAT)	155.4	153.3	235.2	199.5

Statement of Incremental Cash Flows**(₹ in lakh)**

Year	0	1	2	3	4
Material stock	(60)	(105)	-	-	165
Compensation for contract	(90)	-	-	-	-
Contract payment saved	-	150	150	150	150
Tax on contract payment	-	(45)	(45)	(45)	(45)
Incremental profit	-	222	219	336	285
Depreciation added back	-	150	114	84	63
Tax on profits	-	(66.6)	(65.7)	(100.8)	(85.5)
Loan repayment	-	(150)	(150)	(150)	(150)
Profit on sale of machinery (net)	-	-	-	-	15
Total incremental cash flows	(150)	155.4	222.3	274.2	397.5
Present value factor	1.00	0.877	0.769	0.674	0.592
Present value of cash flows	(150)	136.28	170.95	184.81	235.32
Net present value					577.36

Advice: Since the net present value of cash flows is ₹ 577.36 lakh which is positive the management should install the machine for processing the waste.

Notes:

- (i) Material stock increases are taken in cash flows.
- (ii) Idle time wages have also been considered.
- (iii) Apportioned factory overheads are not relevant only insurance charges of this project are relevant.
- (iv) Interest calculated at 14% based on 4 equal installments of loan repayment.
- (v) Sale of machinery- Net income after deducting removal expenses taken. Tax on Capital gains ignored.

- (vi) Saving in contract payment and income tax thereon considered in the cash flows.

Question – 64

XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require ₹ 270 lakhs capital expenditure on new machinery. They expected the capital investment to provide annual cash flows of ₹ 42 lakhs indefinitely which is net of all tax adjustments. The discount rate which it applies to such investment decisions is 14% net.

The directors of the company believe that the current capital structure fails to take advantage of tax benefits of debt, and propose to finance the new project with undated perpetual debt secured on the company's assets. The company intends to issue sufficient debt to cover the cost of capital expenditure and the after tax cost of issue.

The current annual gross rate of interest required by the market on corporate undated debt of similar risk is 10%. The after tax costs of issue are expected to be ₹ 10 lakhs. Company's tax rate is 30%.

You are required to calculate:

- (i) The adjusted present value of the investment,
- (ii) The adjusted discount rate and
- (iii) Explain the circumstance under which this adjusted discount rate may be used to evaluate future investments.

(Exam, May – 2018)

Solution:

(i) Calculation of Adjusted Present Value of Investment (APV)

Adjusted PV = Base Case PV + PV of financing decisions associated with the project

Base Case NPV for the project:

$$\begin{aligned} (-) ₹ 270 \text{ lakhs} + (₹ 42 \text{ lakhs} / 0.14) &= (-) ₹ 270 \text{ lakhs} + ₹ 300 \text{ lakhs} \\ &= ₹ 30 \end{aligned}$$

Issue costs = ₹ 10 lakhs

Thus, the amount to be raised = ₹ 270 lakhs + ₹ 10 lakhs
= ₹ 280 lakhs

Annual tax relief on interest payment = ₹ 280 × 0.1 × 0.3
= ₹ 8.4 lakhs in perpetuity

The value of tax relief in perpetuity = ₹ 8.4 lakhs / 0.1
= ₹ 84 lakhs

Therefore, APV = Base case PV – Issue Costs + PV of Tax Relief on debt interest
= ₹ 30 lakhs – ₹ 10 lakhs + 84 lakhs = ₹ 104 lakhs

(ii) Calculation of Adjusted Discount Rate (ADR)

Annual Income/Savings required to allow an NPV to zero

Let the annual income be x.

(-) ₹ 280 lakhs × (Annual Income/0.14) = (-) ₹ 104 lakhs

Annual Income/0.14 = (-) ₹ 104 + ₹ 280 lakhs

Therefore, Annual income = ₹ 176 × 0.14 = ₹ 24.64 lakhs

Adjusted discount rate = (₹ 24.64 lakhs / ₹ 280 lakhs) × 100
= 8.8%

(iii) Useable circumstances

This ADR may be used to evaluate future investments only if the business risk of the new venture is identical to the one being evaluated here and the project is to be financed by the same method on the same terms. The effect on the company's cost of capital of introducing debt into the capital structure cannot be ignored.

Question – 65

Alley Pvt. Ltd. is planning to invest in a machinery that would cost ₹ 1,00,000 at the beginning of year 1. Net cash inflows from operations have been estimated at ₹ 36,000 per annum for 3 years. The company has two options for smooth functioning of the machinery - one is service, and another is replacement of parts. If the company opts to service a part of the machinery at the end of year 1 at ₹ 20,000, in such a case, the scrap value at the end of year 3 will be ₹ 25,000. However, if the company decides not to service the part, then it will have to be replaced at the end of year 2 at ₹ 30,800, and in this case, the machinery will work for the 4th year also and get operational cash inflow of ₹ 36,000 for the 4th year. It will have to be scrapped at the end of year 4 at ₹ 18,000.

Assuming cost of capital at 10% and ignoring taxes, DETERMINE the purchase of this machinery based on the net present value of its cash flows.

If the supplier gives a discount of ₹ 10,000 for purchase, what would be your decision?

Note: The PV factors at 10% are:

Year	0	1	2	3	4	5	6
PV Factor	1	0.9091	0.8264	0.7513	0.6830	0.6209	0.5645

(Study Material ICAI TYK – 07)

Solution:**Option I: Purchase machinery and service part at the end of Year 1.**

Net present value of cash flow @ 10% per annum discount rate.

$$\begin{aligned}
 \text{NPV (in ₹)} &= -1,00,000 + \frac{36,000}{(1.1)} + \frac{36,000}{(1.1)^2} + \frac{36,000}{(1.1)^3} + \frac{20,000}{(1.1)} + \frac{20,000}{(1.1)^3} \\
 &= -1,00,000 + 36,000 (0.9091 + 0.8264 + 0.7513) - (20,000 \times 0.9091) + (25,000 \times 0.7513) \\
 &= -1,00,000 + (36,000 \times 2.4868) - 18,182 + 18,782.5 \\
 &= -1,00,000 + 89,524.8 - 18,182 + 18,782.5 \\
 \text{NPV} &= -9,874.7
 \end{aligned}$$

Since, Net Present Value is negative; therefore, this option is not to be considered.

If Supplier gives a discount of ₹ 10,000, then:

$$\text{NPV (in ₹)} = + 10,000 - 9,874.7 = + 125.3$$

In this case, Net Present Value is positive but very small; therefore, this option may not be advisable.

Option II: Purchase Machinery and Replace Part at the end of Year 2.

$$\begin{aligned} \text{NPV (in ₹)} &= -1,00,000 + \frac{36,000}{(1.1)} + \frac{36,000}{(1.1)^2} + \frac{36,000}{(1.1)^3} - \frac{30,800}{(1.1)^2} + \frac{54,000}{(1.1)^4} \\ &= -1,00,000 + 36,000 (0.9091 + 0.8264 + 0.7513) - (30,800 \times 0.8264) + (54,000 \times 0.6830) \\ &= -1,00,000 + 36,000 (2.4868) - 25,453.12 + 36,882 \\ &= -1,00,000 + 89,524.8 - 25,453.12 + 36,882 \\ \text{NPV} &= + 953.68 \end{aligned}$$

Net Present Value is positive, but very low as compared to the investment.

If the Supplier gives a discount of ₹ 10,000, then:

$$\text{NPV (in ₹)} = 10,000 + 953.68 = 10,953.68$$

Decision: Option II is worth investing as the net present value is positive and higher as compared to Option I.

Multiple Choice Questions (MCQs)

1. A capital budgeting technique which does not require the computation of cost of capital for decision making purposes is:
 - (a) Net Present Value method
 - (b) Internal Rate of Return method
 - (c) Modified Internal Rate of Return method
 - (d) Payback Period method

- 2.** If two alternative proposals are such that the acceptance of one shall exclude the possibility of the acceptance of another then such decision making will lead to:
- (a) Mutually exclusive decisions
 - (b) Accept reject decisions
 - (c) Contingent decisions
 - (d) None of the above
- 3.** In case a company considers a discounting factor higher than the cost of capital for arriving at present values, the present values of cash inflows will be:
- (a) Less than those computed on the basis of cost of capital
 - (b) More than those computed on the basis of cost of capital
 - (c) Equal to those computed on the basis of the cost of capital
 - (d) None of the above
- 4.** If the cut off rate of a project is greater than IRR, we may:
- (a) Accept the proposal
 - (b) Reject the proposal
 - (c) Be neutral about it
 - (d) Wait for the IRR to increase and match the cut off rate
- 5.** While evaluating capital investment proposals, time value of money is used in which of the following techniques:
- (a) Payback Period method
 - (b) Accounting rate of return
 - (c) Net present value
 - (d) None of the above
- 6.** IRR would favour project proposals which have:

- (a) Heavy cash inflows in the early stages of the project.
 - (b) Evenly distributed cash inflows throughout the project.
 - (c) Heavy cash inflows at the later stages of the project.
 - (d) None of the above.
- 7.** The re-investment assumption in the case of the IRR technique assumes that:
- (a) Cash flows can be re-invested at the projects IRR.
 - (b) Cash flows can be re-invested at the weighted cost of capital.
 - (c) Cash flows can be re-invested at the marginal cost of capital.
 - (d) None of the above
- 8.** Multiple IRRs are obtained when:
- (a) Cash flows in the early stages of the project exceed cash flows during the later stages.
 - (b) Cash flows reverse their signs during the project.
 - (c) Cash flows are uneven.
 - (d) None of the above.
- 9.** Depreciation is included as a cost in which of the following techniques:
- (a) Accounting rate of return
 - (b) Net present value
 - (c) Internal rate of return
 - (d) None of the above
- 10.** Management is considering a ₹ 1,00,000 investment in a project with a 5 year life and no residual value. If the total income from the project is expected to be ₹ 60,000 and recognition is given to the effect of straight line depreciation on the investment, the average rate of return is:
- (a) 12%

- (b) 24%
 - (c) 60%
 - (d) 75%
- 11.** Assume cash outflow equals ₹ 1,20,000 followed by cash inflows of ₹ 25,000 per year for 8 years and a cost of capital of 11%. What is the Net present value?
- (a) (₹ 38,214)
 - (b) ₹ 9,653
 - (c) ₹ 8,653
 - (d) ₹ 38,214
- 12.** What is the Internal rate of return for a project having cash flows of ₹ 40,000 per year for 10 years and a cost of ₹ 2,26,009?
- (a) 8%
 - (b) 9%
 - (c) 10%
 - (d) 12%
- 13.** While evaluating investments, the release of working capital at the end of the project's life should be considered as:
- (a) Cash inflow
 - (b) Cash outflow
 - (c) Having no effect upon the capital budgeting decision
 - (d) None of the above
- 14.** Capital rationing refers to a situation where:
- (a) Funds are restricted and the management has to choose from amongst available alternative investments.
 - (b) Funds are unlimited and the management has to decide how to allocate them to suitable projects.

- (c) Very few feasible investment proposals are available with the management.
- (d) None of the above.

15. Capital budgeting is done for:

- (a) Evaluating short term investment decisions.
- (b) Evaluating medium term investment decisions.
- (c) Evaluating long term investment decisions.
- (d) None of the above.

CHAPTER – 06

DIVIDEND DECISIONS

(1) WALTER'S MODEL**Question – 01**

XYZ Ltd. earns ₹ 10/ share. Capitalization rate and return on investment are 10% and 12% respectively.

DETERMINE the optimum dividend payout ratio and the price of the share at the payout.

(Study Material ICAI Illus – 02)

Solution:

Since $r > K_e$, the optimum dividend pay-out ratio would 'Zero' (i.e. $D = 0$),

Accordingly, value of a share:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

$$P = \frac{D + \frac{0.12}{0.10} \times (10 - 0)}{0.10}$$

$$= ₹ 120$$

The optimality of the above payout ratio can be proved by using 25%, 50%, 75% and 100% as pay- out ratio:

At 25% pay-out ratio

$$P = \frac{5 + \frac{0.12}{0.10} \times (10 - 5)}{0.10} = ₹ 115$$

At 50% pay-out ratio

$$P = \frac{2.5 + \frac{0.12}{0.10} \times (10 - 25)}{0.10} = ₹ 110$$

At 75% pay-out ratio

$$P = \frac{7.5 + \frac{0.12}{0.10} \times (10 - 7.5)}{0.10} = ₹ 105$$

At 100% pay-out ratio

$$P = \frac{10 + \frac{0.12}{0.10} \times (10 - 10)}{0.10} = ₹ 100$$

Question – 02

The following figures are collected from the annual report of XYZ Ltd.:

Net Profit	₹ 30 lakhs
Outstanding 12% preference shares	₹ 100 lakhs
No. of equity shares	3 lakhs
Return on Investment	20%
Cost of capital i.e. (Ke)	16%

COMPUTE the approximate dividend pay-out ratio so as to keep the share price at ₹ 42 by using Walter's model?

(Study Material ICAI Illus – 03)

Solution:

	₹ in lakhs
Net Profit	30
Less: Preference dividend	12
Earning for equity shareholders	18
Earning per share	18/3 = ₹ 6.00

Let, the dividend per share be D to get share price of ₹ 42

$$P = \frac{D + \frac{r}{K_e} \times (E - D)}{K_e}$$

$$₹ 42 = \frac{D + \frac{0.20}{0.16} \times (6 - D)}{0.16}$$

$$6.72 = \frac{0.16D + 1.2 - 0.20D}{0.16}$$

$$0.04D = 1.2 - 1.0752$$

$$D = 3.12$$

$$D/P \text{ ratio} = \frac{DPS}{EPS} \times 100 = \frac{3.12}{6} \times 100 = 52\%$$

So, the required dividend payout ratio will be = 52%

Question – 03

The following figures are collected from the annual report of XYZ Ltd.:

Net Profit	₹ 30 lakhs
Outstanding 12% preference shares	₹ 100 lakhs
No. of equity shares	3 lakhs
Return on Investment	20%
Cost of capital i.e. (Ke)	16%

CALCULATE price per share using Gordon's Model when dividend pay-out is (i) 25%; (ii) 50% and (iii) 100%.

(Study Material ICAI Illus – 04)

Solution:

	₹ in lakhs
Net Profit	30
Less: Preference dividend	12
Earning for equity shareholders	18
Earning per share	18/3 = ₹ 6.00

Price per share according to Gordon's Model is calculated as follows:

$$P_0 = \frac{E_1(1-b)}{K_e - br}$$

Here, $E_1 = 6$, $K_e = 16\%$

- (i) When dividend pay-out is 25%

$$P_0 = \frac{6 \times 0.25}{0.16 - (0.75 \times 0.2)} = \frac{1.5}{0.16 - 0.15} = 150$$

- (ii) When dividend pay-out is 50%

$$P_0 = \frac{6 \times 0.25}{0.16 - (0.5 \times 0.2)} = \frac{3}{0.16 - 0.10} = 50$$

- (iii) When dividend pay-out is 100%

$$P_0 = \frac{6 \times 1}{0.16 - (0 \times 0.2)} = \frac{6}{0.16} = 37.50$$

Question – 04

The following information pertains to M/s XY Ltd.

Earnings of the Company	₹ 5,00,000
Dividend Payout ratio	60%
No. of shares outstanding	1,00,000
Equity capitalization rate	12%
Rate of return on investment	15%

CALCULATE:

- Market value per share as per Walter's model.
- Optimum dividend payout ratio according to Walter's model and the market value of Company's share at that payout ratio.

(Study Material ICAI Illus – 09)

Solution:

- (i) As per Walter's model:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹ 5

D = Dividend per share = ₹ 3

R = Return earned on investment = 15%

Ke = Cost of equity capital = 12%

$$P = \frac{3 + \frac{0.15}{0.12}(5-3)}{0.12} = ₹ 45.83$$

- (ii) According to Walter's model, when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.15}{0.12}(5-0)}{0.12} = ₹ 52.08$$

Question – 05

The following information is supplied to you:

	₹
Total Earnings	2,00,000
No. of equity shares (of ₹ 100 each)	20,000
Dividend paid	1,50,000
Price/ Earnings ratio	12.5

Applying Walter's Model:

- ANALYSE whether the company is following an optimal dividend policy.
- COMPUTE P/E ratio at which the dividend policy will have no effect on the value of the share.
- Will your decision change, if the P/E ratio is 8 instead of 12.5? ANALYSE.

(Study Material ICAI TYK – 02)

Solution:

- (i) The EPS of the firm is ₹ 10 (i.e., ₹ 2,00,000/ 20,000), $r = ₹ 2,00,000 / (20,000 \text{ shares} \times ₹ 100) = 10\%$. The P/E Ratio is given at 12.5 and the cost of capital (K_e) may be taken at the inverse of P/E ratio. Therefore, K_e is 8 (i.e., $1/12.5$). The firm is distributing total dividends of ₹ 1,50,000 among 20,000 shares, giving a dividend per share of ₹ 7.50. the value of the share as per Walter's model may be found as follows:

$$P = \frac{D + \frac{r}{K_e}(E-D)}{K_e} = \frac{7.5 + \frac{0.1}{0.08}(10-7.5)}{0.08} = ₹ 132.81$$

The firm has a dividend payout of 75% (i.e., ₹ 1,50,000) out of total earnings of ₹ 2,00,000. Since, the rate of return of the firm (r) is 10% and it is more than the K_e of 8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be:

$$= \frac{0 + \frac{0.1}{0.08}(10-0)}{0.08} = ₹ 156.25$$

So, theoretically the market price of the share can be increased by adopting a zero payout.

- (ii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the K_e would be equal to the rate of return (r) of the firm. The K_e would be 10% ($= r$) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the share.
- (iii) If the P/E is 8 instead of 12.5, then the K_e which is the inverse of P/E ratio, would be 12.5 and in such a situation $k_e > r$ and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{K_e}(E-D)}{K_e} = \frac{7.5 + \frac{0.1}{0.125}(10-7.5)}{0.125} = ₹ 76$$

Question – 06

The following information is supplied to you:

Particulars	₹
Total Earnings	5,00,000
Equity shares (of ₹ 100 each)	50,00,000
Dividend paid	3,75,000
Price/Earnings ratio	12.5

Applying Walter's Model:

- ANALYSE whether the company is following an optimal dividend policy.
- COMPUTE P/E ratio at which the dividend policy will have no effect on the value of the share.
- Will your decision change, if the P/E ratio is 8 instead of 12.5? ANALYSE.

(MTP Nov – 2021)

Solution:

- (i) The EPS of the firm is ₹ 10 (i.e. ₹ 5,00,000 / 50,000). $r = 5,00,000 / 50,00,000 = 10\%$. The P/E Ratio is given at 12.5 and the cost of capital, K_e , may be taken at the inverse of P/E ratio. Therefore, K_e is 8 (i.e., $1/12.5$). The firm is distributing total dividends of ₹ 3,75,000 among 50,000 shares, giving a dividend per share of ₹ 7.50. The value of the share as per Walter's model may be found as follows:

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e} = \frac{7.5 + \frac{0.1}{0.08} (10-7.5)}{0.08} = ₹ 132.81$$

The firm has a dividend payout of 75% (i.e., ₹ 3,75,000) out of total earnings of ₹ 5,00,000. Since, the rate of return of the firm, r , is 10% and it is more than the K_e of 8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be,

$$\frac{0 + \frac{0.1}{0.08} (10-0)}{0.08} = ₹ 156.25$$

So, theoretically, the market price of the share can be increased by adopting a zero payout.

- (ii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the K_e would be equal to the rate of return, r , of the firm. The K_e would be 10% ($= r$) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the share.
- (iii) If the P/E is 8 instead of 12.5, then the K_e which is the inverse of P/E ratio, would be 12.5 and in such a situation $K_e > r$ and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{K_e} (E - D)}{K_e} = \frac{7.5 + \frac{0.1}{0.125} (10 - 7.5)}{0.125} = ₹ 76$$

Question – 07

The following information relates to Navya Ltd:

Earnings of the company	₹ 20,00,000
Dividend pay-out ratio	60%
No. of Shares outstanding	4,00,000
Rate of return on investment	15%
Equity capitalization rate	12%

Required:

- (i) DETERMINE what would be the market value per share as per Walter's model.
- (ii) COMPUTE optimum dividend pay-out ratio according to Walter's model and the market value of company's share at that pay-out ratio.

(RTP May – 2018)

Solution:

Navya Ltd.

- (i) Walter's model is given by –

$$P = \frac{D + (E - D)(r/K_e)}{K_e}$$

Where,

P = Market price per share,

E = Earnings per share = ₹ 20,00,000 ÷ 4,00,000 = ₹ 5

D = Dividend per share = 60% of 5 = ₹ 3

r = Return earned on investment = 15%

K_e = Cost of equity capital = 12%

$$\therefore P = \frac{3 + (5 - 3) \times \frac{0.15}{0.12}}{0.12} = \frac{3 + 2 \times \frac{0.15}{0.12}}{0.12} \times ₹ 45.83$$

- (ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is Nil. So, at a payout ratio of zero, the market value of the company's share will be:-

$$= \frac{0 + (5 - 0) \times \frac{0.15}{0.12}}{0.12} = ₹ 52.08$$

Question – 08

Following information relating to Jee Ltd. is given:

Particulars

Profit after tax	₹ 10,00,000
Dividend pay-out ratio	50%
Number of Equity Shares	50,000
Cost of Equity	10%
Rate of Return on Investment	12%

- (i) CALCULATE market value per share as per Walter's Model?
- (ii) What is the optimum dividend pay-out ratio according to Walter's Model and Market value of equity share at that pay-out ratio?

(RTP May – 2020)

Solution:**(i) Walter's model is given by –**

$$P = \frac{D + (E - D)(r/K_e)}{K_e}$$

Where,

P = Market price per share,

E = Earnings per share = ₹ 10,00,000 ÷ 50,000 = ₹ 20

D = Dividend per share = 50% of 20 = ₹ 10

r = Return earned on investment = 12%

 K_e = Cost of equity capital = 10%

$$\therefore P = \frac{10 + (20 - 10) \times \frac{0.12}{0.10}}{0.10} = \frac{22}{0.10} = ₹ 220$$

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is Nil. So, at a pay-out ratio of zero, the market value of the company's share will be:

$$\frac{10 + (20 - 0) \times \frac{0.12}{0.10}}{0.10} = \frac{24}{0.10} = ₹ 240$$

Question – 09

The Following information is supplied to you:

	(₹)
Total Earnings	2,00,000
No. of equity shares (of ₹ 100 each)	20,000
Dividend paid	1,50,000
Price/Earnings ratio	12.5

Applying Walter's Model:

(i) ANALYSE whether the company is following an optimal dividend policy.

- (ii) COMPUTE P/E ratio at which the dividend policy will have no effect on the value of the share.
- (iii) Will your decision change if the P/E ratio is 8 instead of 12.5? ANALYSE.

(RTP May – 2021)**Solution:**

- (i) The EPS of the firm is ₹ 10 (i.e., ₹ 2,00,000 / 20,000) and $r = 2,00,000 / (20,000 \text{ shares} \times ₹ 100) = 10\%$. The P/E Ratio is given at 12.5 and the cost of capital, K_e , may be taken at the inverse of P/E ratio. Therefore, K_e is 8 (i.e., $1/12.5$). The firm is distributing total dividends of ₹1,50,000 among 20,000 shares, giving a dividend per share of ₹7.50. the value of the share as per Walter's model may be found as follows:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e} = \frac{7.5 + \frac{0.1}{0.08}(10 - 7.5)}{0.08} = ₹ 132.81$$

The firm has a dividend payout of 75% (i.e., ₹ 1,50,000) out of total earnings of ₹ 2,00,000. Since, the rate of return of the firm, r , is 10% and it is more than the K_e of 8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be-

$$= \frac{0 + \frac{0.1}{0.08}(10 - 0)}{0.08} = ₹ 156.25$$

So, theoretically the market price of the share can be increased by adopting a zero payout.

- (ii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the K_e would be equal to the rate of return, r , of the firm. The K_e would be 10% ($= r$) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the share.
- (iii) If the P/E is 8 instead of 12.5, then the K_e which is the inverse of P/E ratio, would be 12.5 and in such a situation $k_e > r$ and the market price, as per Walter's model would be.

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e} = \frac{7.5 + \frac{0.1}{0.125} (10 - 7.5)}{0.125} = ₹ 76$$

Question – 10

The following figures have been collected from the annual report of ABC Ltd. for the current financial year:

Net Profit	₹ 75 lakhs
Outstanding 12% preference shares	₹ 250 lakhs
No. of equity shares	7.50 lakhs
Return on investment	20%
Cost of capital i.e. (K _e)	16%

- COMPUTE the approximate dividend pay-out ratio so as to keep the share price at ₹ 42 by using Walter's model?
- DETERMINE the optimum dividend pay-out ratio and the price of the share at such pay-out.
- PROVE that the dividend pay-out ratio as determined above in (b) is optimum by using random pay-out ratio.

(RTP May – 2022)

Solution:

(a)

	₹ in lakhs
Net Profit	75
Less: Preference dividend	30
Earning for equity shareholders	45
Earning per share	= 45/7.5 = ₹ 6.00

Let, the dividend per share be D to get share price of ₹ 42

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e}$$

$$₹ 42 = \frac{D + \frac{0.20}{0.16} (6-D)}{0.16}$$

$$6.72 = \frac{0.16D + 1.2 - 0.20D}{0.16}$$

$$0.04D = 1.2 - 1.0752$$

$$D = 3.12$$

$$D/P \text{ ratio} = \frac{DPS}{EPS} \times 100 = \frac{3.12}{6} \times 100 = 52\%$$

So, the required dividend payout ratio will be = 52%

- (b) Since $r > K_e$, the optimum dividend pay-out ratio would 'Zero' (i.e. $D = 0$), Accordingly, value of a share:

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e}$$

$$P = \frac{0 + \frac{0.20}{0.16} (6-0)}{0.16} = ₹ 46.875$$

- (c) The optimality of the above pay-out ratio can be proved by using 25%, 50%, 75% and 100% as pay-out ratio:

At 25% pay-out ratio

$$P = \frac{1.5 + \frac{0.20}{0.16} (6-1.5)}{0.16} = ₹ 44.531$$

At 50% pay-out ratio

$$P = \frac{3 + \frac{0.20}{0.16} (6-3)}{0.16} = ₹ 42.188$$

At 75% pay-out ratio

$$P = \frac{4.5 + \frac{0.20}{0.16} (6-4.5)}{0.16} = ₹ 39.844$$

At 100% pay-out ratio

$$P = \frac{6 + \frac{0.20}{0.16} (6-6)}{0.16} = ₹ 37.50$$

From the above it can be seen that price of share is maximum when dividend pay-out ratio is 'zero' as determined in (b) above.

Question – 11

The following information pertains to SD Ltd.

Earnings of the Company	₹ 50,00,000
Dividend Payout ratio	60 %
No. of shares outstanding	10,00,000
Equity capitalization rate	12 %
Rate of return on investment	15 %

- (i) COMPUTE the market value per share as per Walter's model?
- (ii) COMPUTE the optimum dividend payout ratio according to Walter's model and the market value of Company's share at that payout ratio?

(RTP Nov – 2019)

Solution:

- (i) Walter's model is given by

$$P = \frac{D + \frac{r}{K_e}(E-D)}{K_e}$$

Where P = Market price per share.

E = Earnings per share = ₹ 5

D = Dividend per share = ₹ 3

R = Return earned on investment = 15%

K_e = Cost of equity capital = 12%

$$P = \frac{3 + \frac{0.15}{0.12}(5 - 3)}{K_e} = ₹ 45.83$$

- (ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.15}{0.12} (5-0)}{0.12} = ₹ 52.08$$

Question – 12

The following figure are extracted from the annual report of RJ Ltd.:

Net Profit	₹ 50 lakhs
Outstanding 13% preference shares	₹ 200 lakhs
No. of Equity Shares	6 lakhs
Return on Investment	25%
Cost of Capital (Ke)	15%

You are required to compute the approximate dividend pay-out ratio by keeping the share price at ₹ 40 by using Walter's Model.

(Exam Nov – 2020)

Solution:

Particulars	₹ in lakhs
Net Profit	50
Less: Preference dividend (₹ 200,00,000 × 13%)	26
Earning for equity shareholders	24
Therefore, earning per share = ₹ 24 lakh / 6 lakh shares = ₹ 4	

Let, the dividend per share be D to get share price of ₹ 40

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e}$$

$$₹ 40 = \frac{D + \frac{0.25}{0.15} (₹ 4 - D)}{0.15}$$

$$6 = \frac{0.15D + 1 - 0.25D}{0.15}$$

$$0.1D = 1 - 0.9$$

$$D = ₹ 1$$

$$D/P \text{ ratio} = \frac{DPS}{EPS} \times 100 = \frac{₹ 1}{₹ 4} \times 100 = \mathbf{25\%}$$

So, the required dividend pay-out ratio will be = 25%

(2) GORDON'S MODEL

Question – 13

XYZ is a company having share capital of ₹ 10 lakhs of ₹ 10 each. It distributed current dividend of 20% per annum. Annual growth rate in dividend expected is 2%. The expected rate of return on its equity capital is 15%. CALCULATE price of share applying Gordon's growth Model.

(Study Material ICAI Illus – 06)

Solution:

$$P = \frac{D_0(1+g)}{K_e - g} = \frac{2(1+0.02)}{0.15 - 0.02} = ₹ 15.69$$

Question – 14

A firm had paid dividend at ₹ 2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. DETERMINE the estimated market price of the equity share if the estimated growth rate of dividends (i) rises to 8%, and (ii) falls to 3%. Also FIND OUT the present market price of the share, given that the required rate of return of the equity investors is 15%.

(Study Material ICAI Illus – 07)

Solution:

In the present situation, the current MPS is as follows:

$$P = \frac{D_0(1+g)}{K_e - g} = \frac{2(1+0.05)}{0.15 - 0.05} = ₹ 21$$

(i) The impact of changes in growth rate to 8% on MPS will be as follows:

$$P = \frac{2(1+0.08)}{0.15 - 0.08} = ₹ 30.86$$

(ii) The impact of changes in growth rate to 3% on MPS will be as follows:

$$P = \frac{2(1+0.03)}{0.15-0.03} = ₹ 17.17$$

So, the market price of the share is expected to vary in response to change in expected growth rate of dividends.

Question – 15

Taking an example of three different firms i.e. growth, normal and declining, CALCULATE the share price using Gordon's model.

Factors	Growth Firm $r > K_e$	Normal Firm $r = K_e$	Declining Firm $r < K_e$
r (rate of return on retained earnings)	15%	10%	8%
K_e (Cost of Capital)	10%	10%	10%
E (Earning Per Share)	₹ 10	₹ 10	₹ 10
b (Retained Earnings)	0.6	0.6	0.6
1- b (Dividend Payout)	0.4	0.4	0.4

(Study Material ICAI Illus – 10)

Solution:

$$P_0 = \frac{E(1-b)}{K_e - br}$$

(i) Situation-1: Growth Firm $r > K_e$

$$P_0 = \frac{10(1-0.6)}{0.10-0.15 \times 0.6} = \frac{4}{0.10-0.09} = ₹ 400$$

(ii) Situation-2: Normal Firm $r = K_e$

$$P_0 = \frac{10(1-0.6)}{0.10-0.10 \times 0.6} = \frac{4}{0.10-0.06} = ₹ 100$$

(ii) Situation-2: Normal Firm $r < K_e$

$$P_0 = \frac{10(1-0.6)}{0.10-0.08 \times 0.6} = \frac{4}{0.10-0.048} = ₹ 76.92$$

If the retention ratio (b) is changed from 0.6 to 0.4, the new share price will be as follows:

Growth Firm

$$P_0 = \frac{10(1-0.4)}{0.10-0.15 \times 0.4} = \frac{6}{0.10-0.06} = ₹ 150$$

Normal Firm

$$P_0 = \frac{10(1-0.4)}{0.10-0.10 \times 0.4} = \frac{6}{0.10-0.04} = ₹ 100$$

Declining Firm

$$P_0 = \frac{10(1-0.4)}{0.10-0.08 \times 0.4} = \frac{6}{0.10-0.032} = ₹ 88.24$$

From the above analysis, it can be concluded that:

When $r > k$, the market value increases with retention ratio.

When $r < k$, the market value of share stands to decrease.

When $r = k$, the market value is not affected by dividend policy.

The conclusion of the Gordon's model is similar to that of Walter's model.

Question – 16

The following information is given below in case of Aditya Ltd.:

Earnings per share = ₹ 60

Capitalization rate = 15%

Return on investment = 25%

Dividend payout ratio = 30%

- (i) COMPUTE price per share using Walter's Model.
- (ii) WHAT would be optimum dividend payout ratio per share under Gordon's Model.

(Study Material ICAI Illus – 11)

Solution:

- (i) **As per Walter's Model, Price per share is computed by using the following formula:**

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where,

P = Market Price of the share.

E = Earnings per share.

D = Dividend per share.

K_e = Cost of equity/ rate of capitalization/ discount rate.

r = Internal rate of return/ return on investment

Applying the above formula, price per share

$$P = \frac{18 + \frac{0.25}{0.15}(60 - 18)}{0.15}$$

$$\text{Or, } P = \frac{18 + 70}{0.15} = ₹ 586.67$$

- (ii) **As per Gordon's model, when $r > K_e$, optimum dividend payout ratio is 'Zero'.**

Question – 17

With the help of following figures CALCULATE the market price of a share of a company by using:

- (i) Walter's formula
(ii) Dividend growth model (Gordon's formula)

Earning per share (EPS)	₹ 10
Dividend per share (DPS)	₹ 6
Cost of capital (K_e)	20%
Internal rate of return on investment	25%
Retention Ratio	40%

Solution:**Market price per share by****(i) Walter's model**

$$P = \frac{D + \frac{r}{K_e}(E-D)}{K_e} = \frac{6 + \frac{0.25}{0.20}(10-6)}{0.20} = ₹ 55$$

(ii) Gordon's model

Present market price per share

$$(P_0) = \frac{E(1-b)}{k-br}$$

$$P_0 = \frac{10(1-0.40)}{0.20 - (0.4 \times 0.25)}$$

$$= \frac{6}{0.1} = ₹ 60$$

Question – 18

The annual report of XYZ Ltd. provides the following information:

Particulars	Amount (₹)
Net Profit	50 lakhs
Outstanding 15% preference shares	100 lakhs
No. of equity shares	5 lakhs
Return on Investment	20%
Cost of capital i.e. (Ke)	16%

CALCULATE price per share using Gordon's Model when dividend pay-out is:

- (i) 25%;
- (ii) 50%;
- (iii) 100%.

Solution:

Price per share according to Gordon's Model is calculated as follows:

Particulars	Amount in ₹
Net Profit	50 lakhs
Less: Preference dividend	15 lakhs
Earnings for equity shareholders	35 lakhs
Earnings per share	35 lakhs/5 lakhs = ₹ 7.00

Price per share according to Gordon's Model is calculated as follows:

$$(P_0) = \frac{E_1(1 - b)}{k - br}$$

Here, $E_1 = 7$, $K_e = 16\%$

(i) When dividend pay-out is 25%

$$P_0 = \frac{7 \times 0.25}{0.16 - (0.75 \times 0.2)} = \frac{1.75}{0.16 - 0.15} = ₹ 175$$

(ii) When dividend pay-out is 50%

$$P_0 = \frac{7 \times 0.5}{0.16 - (0.5 \times 0.2)} = \frac{3.5}{0.16 - 0.10} = ₹ 58.33$$

(iii) When dividend pay-out is 100%

$$P_0 = \frac{7 \times 1}{0.16 - (0 \times 0.2)} = \frac{7}{0.16} = ₹ 43.75$$

Question – 19

A&R Ltd. is a large-cap multinational company listed in BSE in India with a face value of ₹ 100 per share. The company is expected to grow @ 15% p.a. for next four years then 5% for an indefinite period. The shareholders expect 20% return on their share investments. Company paid ₹ 120 as dividend per share for the current Financial Year. The shares of the company traded at an average price of ₹ 3,122 on last day. FIND out the intrinsic value per share and state whether shares are overpriced or underpriced.

(Study Material ICAI TYK – 05)

Solution:

As per Dividend discount model, the price of share is calculated as follows:

$$P = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} + \frac{D_4}{(1+K_e)^4} + \frac{D_5}{(K_e-g)} \times \frac{1}{(1+K_e)^5}$$

Where,

P = Price per share

K_e = Required rate of return on equity

g = Growth rate

$$P = \frac{₹120 \times 1.15}{(1+0.2)^1} + \frac{₹138 \times 1.15}{(1+0.2)^2} + \frac{₹158.7 \times 1.15}{(1+0.2)^3} + \frac{₹182.5 \times 1.15}{(1+0.2)^4} + \frac{₹209.88 \times 1.05}{(0.2-0.05)} \times \frac{1}{(1+0.2)^5}$$

$$P = 115 + 110.2 + 105.6 + 101.2 + 590.42 = ₹ 1,022.42$$

Intrinsic value of share is ₹ 1,022.42 as compared to latest market price of ₹ 3,122. Market price of a share is overpriced by ₹ 2,099.58.

Question – 20

In the month of May of the current Financial Year, shares of RT Ltd. was sold for ₹ 1,460 per share. A long term earnings growth rate of 7.5% is anticipated. RT Ltd. is expected to pay dividend of ₹ 20 per share.

- (i) CALCULATE rate of return an investor can expect to earn assuming that dividends are expected to grow along with earnings at 7.5% per year in perpetuity?
- (ii) It is expected that RT Ltd. will earn about 10% on retained earnings and shall retain 60% of earnings. In this case, STATE whether, there would be any change in growth rate and cost of Equity?

(Study Material ICAI TYK – 06)

Solution:

- (i) According to Dividend Discount Model approach, the firm's expected or required return on equity is computed as follows:

$$K_e = \frac{D_1}{P_0} + g$$

$$K_e = \frac{20(1+0.075)}{1,460} + 7.5\%$$

$$= 0.0147 + 0.075 = 0.0897 \text{ or } 8.97\%$$

- (ii) With rate of return on retained earnings (r) is 10% and retention ratio (b) is 60%, new growth rate will be as follows:

$$g = br = 0.10 \times 0.60 = 0.06$$

Accordingly, dividend will also get changed and to calculate this, first we shall calculate previous retention ratio (b1) and then EPS assuming that rate of return on retained earnings (r) is same.

With previous Growth Rate of 7.5% and $r = 10\%$, the retention ratio comes out to be:

$$0.075 = b_1 \times 0.10$$

$$b_1 = 0.75 \text{ and payout ratio} = 0.25$$

With 0.25 payout ratio the EPS will be as follows:

$$\frac{\text{₹}20}{0.25} = \text{₹} 80$$

With new 0.40 (1 – 0.60) payout ratio, the new dividend will be

$$D_1 = \text{₹} 80 \times 0.40 = \text{₹} 32$$

Accordingly, new K_e will be

$$K_e = \frac{32}{1,460} + 6.0\%$$

$$\text{Or, } K_e = 8.19\%$$

Question – 21

The following information is given:

Dividend per share (DPS)	₹ 9
Cost of capital (K_e)	19%
Internal rate of return on investment	24%
Retention ratio	25%

Calculation the market price per share by using:

- (i) Walter's formula
- (ii) Gordon's formula (Dividend Growth Model)

(MTP March – 2021)

Solution:**Working:****Calculation of Earnings per share (EPS):**

$$\text{EPS} = \frac{\text{DPS}}{\text{Dividend Payout Ratio}}$$

$$\text{EPS} = \frac{₹ 9}{1-0.25} = ₹ 12$$

Market price per share by**(i) Walter's model:**

$$\begin{aligned} P &= \frac{D + \frac{r}{K_e}(E - D)}{K_e} \\ &= \frac{₹ 9 + \frac{0.24}{0.19} (₹ 12 - ₹ 9)}{0.19} \\ &= ₹ 67.31 \end{aligned}$$

(ii) Gordon's model (Dividend Growth model):

$$P_0 = \frac{D_0 (1 + g)}{K_e - g}$$

Where,

P_0 = Present market price per share.

g = Growth rate (br) = $0.25 \times 0.24 = 0.06$

b = Retention ratio

k = Cost of Capital

r = Internal rate of return (IRR)

D_0 = Dividend per share

E = Earnings per share

$$= \frac{₹ 9 (1 + 0.06)}{₹ 0.19 - 0.06} = \frac{₹ 9.54}{₹ 0.13} = ₹ 73.38$$

Alternatively,

$$P_0 = \frac{E (1-b)}{k-br}$$

$$P_0 = \frac{12 (1-0.25)}{0.19-0.06} = \frac{9}{0.13} = ₹ 69.23$$

Question – 22

Following information is given for WN Ltd.:

Earnings	₹ 30 per share
Dividend	₹ 9 per share
Cost of capital	15%
Internal Rate of Return on investment	20%

You are required to CALCULATE the market price per share using-

- (i) Gordon's formula
- (ii) Walter's formula

(MTP Sep – 2022)

Solution:

- (i) As per **Gordon's Model**, Price per share is computed using the formula:

$$P_0 = \frac{E_1 (1 - b)}{K_e - br}$$

Where,

P_0 = Price per share

E_1 = Earnings per share

b = Retention ratio; ($1 - b$ = Pay-out ratio)

K_e = Cost of capital

r = IRR

br = Growth rate (g)

Applying the above formula, price per share

$$P_0 = \frac{30 \times 0.3^*}{0.150.70 \times 0.2} = \frac{9}{0.01} = ₹ 900$$

$$*\text{Dividend pay-out ratio} = \frac{₹ 9}{₹ 30} = 0.3 \text{ or } 30\%$$

- (ii) **As per Walter's Model, Price per share is computed using the formula:**

$$\text{Price (P)} = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where,

P = Market Price of the share

E = Earnings per share

D = Dividend per share

K_e = Cost of equity/ rate of capitalization/ discount rate

r = Internal rate of return/ return on investment

Applying the above formula, price per share

$$P = \frac{9 + \frac{0.20}{0.15}(30 - 9)}{0.15} = \frac{37}{0.15} = ₹ 246.67$$

Question – 23

The annual report of XYZ Ltd. provides the following information for the Financial Year 2019-20:

Particulars	Amount (₹)
Net Profit	78 lakhs
Outstanding 15% preference shares	120 lakhs
No. of equity shares	6 lakhs
Return on Investment	20 %
Cost of capital i.e. (k_e)	16 %

CALCULATE price per share using Gordon's Model when dividend pay-out is-

- (i) 30%;
- (ii) 50%;
- (iii) 100%.

(MTP October – 2022)

Solution:

Price per share according to Gordon's Model is calculated as follows:

Particulars	Amount in ₹
Net Profit	78 Lakhs
Less : preference dividend (120 lakhs @ 15 %)	18 lakhs
Earnings for equity shareholders	60 lakhs
Earning Per share	60 lakhs/6 lakhs = ₹ 10.00

Price per share according to Gordon's Model is calculated as follows:

$$P_0 = \frac{E_1 (1-B)}{K_e - br}$$

Here , $E_1 = 10$ $K_e = 16\%$

(i) When dividend pay-out is 30%

$$P_0 = \frac{10 \times 0.30}{0.16 (0.70 \times 0.2)} = \frac{3}{0.16 - 0.14} = ₹ 150$$

(ii) When dividend pay-out is 50%

$$P_0 = \frac{10 \times 0.5}{0.16 - (0.5 \times 0.2)} = \frac{5}{0.16 - 0.10} = ₹ 83.33$$

(iii) When dividend pay-out is 100%

$$P_0 = \frac{10 \times 1}{0.16 - (0 \times 0.2)} = \frac{10}{0.16} = ₹ 62.5$$

Question – 24

The following figures are collected from the annual report of XYZ Ltd.:

Year	Cash Flows (₹ in lakhs)
Net Profit	₹ 30 lakhs
Outstanding 12% preference shares	₹ 100 lakhs
No. of equity shares	₹ 3 lakhs
Return on investment	20%
Cost of capital i.e. (K_e)	16%

CALCULATE price per share using Gordon's Model when dividend pay-out is (i) 25%; (ii) 50% and (iii) 100%.

(RTP May – 2019)

Solution:

	₹ in lakhs
Net Profit	30
Less: Preference dividend	12
Earning for equity shareholders	18
Therefore earning per share	$18/3 = 6.00$

Price per share according to Gordon's Model is calculated as follows:

$$P_0 = \frac{E_1(1-b)}{K_e - br}$$

Here, $E_1 = 6$, $K_e = 16\%$

(i) When dividend pay-out is 25%

$$P_0 = \frac{6 \times 0.25}{0.16 - (0.75 \times 0.2)} = \frac{1.5}{0.16 - 0.15} = 150$$

(ii) When dividend pay-out is 50%

$$P_0 = \frac{6 \times 0.5}{0.16 - (0.5 \times 0.2)} = \frac{3}{0.16 - 0.10} = 50$$

(iii) When dividend pay-out is 100%

$$P_0 = \frac{6 \times 1}{0.16 - (0 \times 0.2)} = \frac{6}{0.16} = 37.50$$

Question – 25

The following information is given for QB Ltd.

Earnings per share ₹ 120

Dividend per share ₹ 36

Cost of capital 15%

Internal Rate of Return on investment 20%

CALCULATE the market price per share using

(a) Gordon's formula

(b) Walter's formula

(RTP Nov – 2020)

Solution:

(a) **As per Gordon's Model, Price per share is computed using the formula:**

$$P_0 = \frac{E_1 (1-b)}{K_e - b_r}$$

Where,

P_0 = Price per share

E_1 = Earnings per share

b = Retention ratio; ($1 - b$ = Pay-out ratio)

K_e = Cost of capital

r = IRR

b_r = Growth rate (g)

Applying the above formula, price per share

$$P_0 = \frac{120 (1-0.7)}{0.15 - 0.70 \times 0.2} = \frac{36}{0.01} = ₹ 3,600$$

(b) As per Walter's Model, Price per share is computed using the formula:

$$\text{Price (P)} = \frac{D + \frac{r}{K_e} (E-D)}{K_e}$$

Where,

P = Market Price of the share.

E = Earnings per share.

D = Dividend per share.

K_e = Cost of equity/ rate of capitalization/ discount rate.

r = Internal rate of return/ return on investment

Applying the above formula, price per share

$$P = \frac{36 + \frac{0.20}{0.15} (120-36)}{0.15} = \frac{36}{0.01} = ₹ 3,600$$

$$\text{Or, } P = \frac{36 + 112}{0.15} = ₹ 986.67$$

Question – 26

X Ltd. is a multinational company. Current market price per share is ₹ 2,185. During the F.Y. 2020-21, the company paid ₹ 140 as dividend per share. The company is expected to grow @ 12% p.a. for next four years, then 5% p.a. for an indefinite period. Expected rate of return of shareholders is 18% p.a.

- Find out intrinsic value per share.
- State whether shares are overpriced or underpriced.

Year	1	2	3	4	5
Discounting Factor @ 18%	0.847	0.718	0.608	0.515	0.436

(Exam, Dec – 2021)

Solution:

As per Dividend discount model, the price of share is calculated as follows:

$$P = \frac{D_1}{(1 + K_e)^1} + \frac{D_2}{(1 + K_e)^2} + \frac{D_3}{(1 + K_e)^3} + \frac{D_4}{(1 + K_e)^4} + \frac{D_4 (1+g)}{(K_e - g)^4} \times \frac{1}{(1 + K_e)^4}$$

Where,

P = Price per share

K_e = Required rate of return on equity

g = Growth rate

$$P = \frac{₹ 140 \times 1.12}{(1 + 0.18)^1} + \frac{₹ 156.80 \times 1.12}{(1 + 0.18)^2} + \frac{₹ 175.62 \times 1.12}{(1 + 0.18)^3} + \frac{₹ 196.69 \times 1.12}{(1 + 0.18)^4} + \frac{₹ 220.29 (1+0.05)}{(0.18-0.05)} \times \frac{1}{(1 + 0.18)^4}$$

$$P = 132.81 + 126.10 + 119.59 + 113.45 + 916.34 = ₹ 1,408.29$$

Intrinsic value of share is ₹ 1,408.29 as compared to latest market price of ₹ 2,185. **Market price of share is over-priced by ₹ 776.71.**

Question – 27

The following information is taken from ABC Ltd.

Net Profit for the year	₹ 30,00,000
12% Preference share capital	₹ 1,00,00,000
Equity share capital (Share of ₹ 10 each)	₹ 60,00,000
Internal rate of return on investment	22%
Cost of Equity Capital	18%
Retention Ratio	75%

Calculate the market price of the share using:

- (1) Gordon's Model
- (2) Walter's Model

(Exam, Jan – 2021)

Solution:

Market price per share by-

(1) Gordon's Model:

$$\text{Present market price per share } (P_0)^* = \frac{D_0 (1+g)}{K_e - g}$$

OR

$$\text{Present market price per share } (P_0) = \frac{D_1}{K_e - g}$$

Where,

P_0 = Present market price per share.

g = Growth rate (br) = $0.75 \times 0.22 = 0.165$

b = Retention ratio (i.e., % of earnings retained)

r = Internal rate of return (IRR)

$$D_0 = E \times (1 - b) = 3 \times (1 - 0.75) = 0.75$$

E = Earnings per share

$$P_0 = \frac{0.75 (1 + 0.165)}{0.18 - 0.165} = \frac{0.874}{0.015} = ₹ 58.27 \text{ approx.}$$

*Alternatively, P_0 can be calculated as $\frac{E (1-b)}{K-br} = ₹ 50$.

(2) Walter's Model:

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e}$$

$$= \frac{0.75 + \frac{0.22}{0.18} (3 - 0.75)}{0.18} = ₹ 19.44$$

Workings:

1. Calculation of Earnings per share

Particulars	Amount (₹)
Net Profit for the year	30,00,000
Less: Preference dividend (12% of ₹ 1,00,00,000)	(12,00,000)
Earnings for equity shareholders	18,00,000
No. of equity shares (₹ 60,00,000/₹10)	6,00,000
Therefore, Earnings per share ($\frac{\text{Earning for equity shareholders}}{\text{No. of equity shares}}$)	₹ 18,00,000 / 6,00,000 = ₹ 3.00

2. Calculation of Dividend per share

Particulars	
Earnings per share	₹ 3
Retention Ratio (b)	75%
Dividend pay-out ratio (1-b)	25%
Dividend per share (Earnings per share × Dividend pay-out ratio)	₹ 3 × 0.25 = ₹ 0.75

Question – 28

The following information relates to LMN Ltd.

Earning of the company	₹ 30,00,000
Dividend pay-out ratio	60%
No. of shares outstanding	5,00,000
Rate of return on investment	15%
Equity capitalized rate	13%

Required:

- (i) Determine what would be the market value per share as per Walter's model.
- (ii) Compute optimum dividend pay-out ratio according to Walter's model and the market value of company's share at that pay-out ratio.

(Exam, July – 2021)

Solution:**(i) Calculation of market value per share as per Walter's model**

$$P = \frac{D + \frac{r}{K_e} (E - D)}{K_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹ 30,00,000 / 5,00,000 = ₹ 6

D = Dividend per share = ₹ 6 × 0.60 = ₹ 3.6

r = Return earned on investment = 15%

K_e = Cost of equity capital = 13%

$$P = \frac{3.6 + \frac{0.15}{0.13} (6 - 3.6)}{0.13} = ₹ 49$$

- (ii) According to Walter's model, when the return on investment (r) is more than the cost of equity capital (K_e), the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.15}{0.13} (6 - 0)}{0.13} = ₹ 53.254$$

Question – 29

The following information is supplied to your :

Total Earning	₹ 40 Lakhs
No. of Equity shares (of ₹ 100 each)	4,00,000
Dividend per share	₹ 4
Cost of Capital	16%
Internal rate of return on investment	20%
Retention ratio	60%

Calculate the market price of a share of a company by using

- (i) Walter's formula
(ii) Gordon's formula

(Exam, May – 2019)

Solution:

$$\text{Earning Per share (E)} = \frac{₹ 40 \text{ Lakhs}}{4,00,000} = ₹ 10$$

Calculation of Market price per share by

(i) **Walter's formula:** Market Price (P) = $\frac{D + \frac{r}{K_e} (E - D)}{K_e}$

Where,

P = Market Price of the share.

E = Earnings per share.

D = Dividend per share.

K_e = Cost of equity/ rate of capitalization/ discount rate.

R = Internal rate of return/ return on investment

$$P = \frac{4 + \frac{0.20}{0.16} (10-4)}{0.16} = \frac{4+7.5}{0.16} = ₹ 71.88$$

- (ii) Gordon's formula: When the growth is incorporated in earnings and dividend, the present value of market price per share (P_0) is determined as follows

$$\text{Gordon's theory: } P_0 = \frac{E (1-b)}{k-br}$$

Where,

P_0 = Present market price per share.

E = Earnings per share

b = Retention ratio (i.e. % of earnings retained)

r = Internal rate of return (IRR)

Growth rate (g) = br

$$\text{Now } P_0 = \frac{10 (1-.60)}{.16-(.60 \times .20)} = ₹ \frac{4}{.04} = ₹ 100$$

Question – 30

Following information relating to Jee Ltd. are given :

Particulars

Profit after tax	₹ 10,00,000
Dividend pay	50%
Number of Equity Shares	50,000
Cost of Equity	10%

Rate of return on Investment 12%

- (i) What would be the market value per share as per Walter's Model ?
- (ii) what is the optimum dividend payout ratio according to Walter's Model and market value of equity share at that payout ratio ?

(Exam, Nov – 2018)

Solution:

- (i) Walter's model is given by –**

$$P = \frac{D + (E - D)(r/K_e)}{K_e}$$

Where,

P = Market price per share

E = Earnings per share ₹ 10,00,000/50,000 = ₹ 20

D = Dividend per share = 50% of 20 = ₹ 10

r = Return earned on investment = 12%

K_e = Cost of equity capital = 10%

$$P = \frac{10 + (20 - 10) \times \frac{0.12}{0.10}}{0.10} = \frac{22}{0.10} = ₹ 220$$

- (ii)** According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend payout ratio decreases. Hence, the optimum dividend payout ratio in this case is Nil. So, at a payout ratio of zero, the market value of the company's share will be :-

$$P = \frac{0 + (20 - 0) \times \frac{0.12}{0.10}}{0.10} = \frac{24}{0.10} = ₹ 240$$

Question – 31

Following figures and information were extracted from the company A Ltd.

Earnings of the company ₹ 10,00,000

Dividend paid	₹ 6,00,000
No. of shares outstanding	2,00,000
Price earnings Ratio	10
Rate of return on investment	20%

You are required to calculate :

- (i) Current Market price of the share
- (ii) Capitalization Rate of its risk class.
- (iii) What should be the optimum payout ratio ?
- (iv) What should be the market price per share at option payout ratio ? (use Walter's Model)

(Exam Nov – 2019)

Solution:

(i) Current Market price of shares (applying Walter's Model)

- The EPS of the firm is ₹ 5 (i.e., ₹ 10,00,000/2,00,000).
- Rate of return on Investment (r) = 20%.
- The Price Earnings (P/E) Ratio is given as 10, so capitalization rate (K_e), may be taken at the inverse of P/E Ratio. Therefore, K_e is 10% or .10 (i.e., 1/10).
- The firm is distributing total dividends of ₹ 6,00,000 among 2,00,000 shares, giving a dividend per share of ₹ 3.

The value of the share as per Walter's model may be found as follows:

Walter's model is given by-

$$P = \frac{D + \frac{r}{K_e} (E-D)}{K_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹ 5

D = Dividend per share = ₹ 3

R = Return earned on investment = 20 %

K_e = Cost of equity capital = 10% or .10

$$P = \frac{3 + \frac{0.20}{0.10} (5-3)}{0.10} = ₹ 70$$

Current Market Price of shares can also be calculated as follows:

$$\text{Price Earnings (P/E) Ratio} = \frac{\text{Market Price of Share}}{\text{Earnings per Shares}}$$

$$\text{Or, } 10 = \frac{\text{Market Price of Share}}{₹ 10,00,000 / 2,00,000}$$

$$\text{Or, } 10 = \frac{\text{Market Price of Share}}{₹ 5}$$

$$\text{Market Price of Share} = ₹ 50$$

(ii) Capitalization rate (K_e) of its risk class is 10% or .10 (i.e., 1/10).

(iii) Optimum dividend pay-out ratio

According to Walter's model when the return on investment is more than the cost of equity capital (10%), the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil or 0 (zero).

(iv) Market price per share at optimum dividend pay-out ratio

At a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.20}{0.10} (5-0)}{0.10} = ₹ 100$$

(3) M.M. MODEL**Question – 32**

AB Engineering Ltd. belongs to a risk class for which the capitalization rate is 10%. It currently has outstanding 10,000 shares selling at ₹ 100 each. The firm is contemplating the declaration of a dividend of ₹ 5 share at the end of the current financial year. It expects to have a net income of ₹ 1,00,000 and has a proposal for making new investments of ₹ 2,00,000. CALCULATE the value of the firm when dividends (i) are not paid (ii) are paid.

(Study Material ICAI Illus – 01)**Solution:****CASE 1: Value of the firm when dividends are not paid.**

Step 1: Calculate price at the end of the period

$$K_e = 10\%, \quad P_0 = 100, \quad D_1 = 0$$

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$100 = \frac{P_1 + 0}{1 + 0.10}$$

$$P_1 = 110$$

Step 2: Calculation of funds required for investment

Earning	₹ 1,00,000
Dividend distributed	Nil
Fund available for investment	₹ 1,00,000
Total Investment	₹ 2,00,000
Balance Funds required	₹ 2,00,000 - ₹ 1,00,000 = ₹ 1,00,000

Step 3: Calculation of No. of shares required to be issued for balance funds

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end (P}_1\text{)}}$$

$$\Delta n = \frac{1,00,000}{110}$$

Step 4: Calculation of value of firm

$$nP_0 = \frac{(n + \Delta n)P_1 - I + E}{1 + K_e}$$

$$nP_0 = \frac{(10,000 + \frac{₹ 1,00,000}{₹ 110}) \times ₹ 110 - ₹ 2,00,000 + ₹ 1,00,000}{(1 + 0.10)}$$

$$= ₹ 10,00,000$$

CASE 2: Value of the firm when dividends are paid.

Step 1: Calculate price at the end of the period

$$K_e = 10\%, \quad P_0 = 100, \quad D_1 = 5$$

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$100 = \frac{P_1 + 5}{1 + 0.10}$$

$$P_1 = 105$$

Step 2: Calculation of funds required for investment

Earning	₹ 1,00,000
Dividend distributed	₹ 50,000
Fund available for investment	₹ 50,000
Total Investment	₹ 2,00,000
Balance Funds required	₹ 2,00,000 - ₹ 50,000 = ₹ 1,50,000

Step 3: Calculation of No. of shares required to be issued for balance funds

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end (P}_1\text{)}}$$

$$\Delta n = \frac{₹ 1,50,000}{₹ 110}$$

Step 4: Calculation of value of firm

$$nP_0 = \frac{(n + \Delta n)P_1 - I + E}{1 + K_e}$$

$$nP_0 = \frac{(10,000 + \frac{₹ 1,50,000}{₹ 105}) \times ₹ 105 - ₹ 2,00,000 + ₹ 1,00,000}{(1 + 0.10)}$$

$$= ₹ 10,00,000$$

Thus, it can be seen from the above illustration that the value of the firm remains the same in either case.

In real world, market imperfections create some problems for MM's dividend policy irrelevance proposition.

Question – 33

RST Ltd. has a capital of ₹ 10,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of ₹ 10 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 12%. COMPUTE market price of the share at the end of the year, if

- (i) dividend is not declared
- (ii) dividend is declared

Assuming that the company pays the dividend and has net profits of ₹ 5,00,000 and makes new investments of ₹ 10,00,000 during the period, CALCULATE number of new shares to be issued? Use the MM model.

(Study Material ICAI Illus – 08)

Solution:

Given,

Cost of Equity (K _e)	12%
Number of shares in the beginning (n)	10,000
Current Market Price (P ₀)	₹ 100

Net Profit (E)	₹ 5,00,000
Expected Dividend (D ₁)	₹ 10 per share
Investment (I)	₹ 10,00,000

Computation of market price per share, when:

(i) No dividend is declared:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$100 = \frac{P_1 + 0}{1 + 0.12}$$

$$P_1 = 112 - 0 = ₹ 112$$

(ii) Dividend is declared:

$$100 = \frac{P_1 + 10}{1 + 0.12}$$

$$P_1 = 112 - 10 = ₹ 102$$

Calculation of number of shares required for investment

	₹
Earning	5,00,000
Dividend distributed	1,00,000
Fund available for investment	4,00,000
Total Investment	10,00,000
Balance Funds required	10,00,000 – 4,00,000 = 6,00,000

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end (P}_1\text{)}}$$

$$\Delta n = \frac{6,00,000}{102} = 5,882.35 \text{ or } 5,883 \text{ Shares}$$

Question – 34

M Ltd. belongs to a risk class for which the capitalization rate is 10%. It has 25,000 outstanding shares and the current market price is ₹ 100. It expects a net profit of ₹ 2,50,000 for the year and the Board is considering dividend of ₹ 5 per share.

M Ltd. requires to raise ₹ 5,00,000 for an approved investment expenditure. ILLUSTRATE, how the MM approach affects the value of M Ltd. if dividends are paid or not paid.

(Study Material ICAI TYK – 01)

Solution:

Given,

Cost of Equity (K _e)	10%
Number of shares in the beginning (n)	25,000
Current Market Price (P ₀)	₹ 100
Net Profit (E)	₹ 2,50,000
Expected Dividend (D ₁)	₹ 5 per share
Investment (I)	₹ 5,00,000

Case 1 - When dividends are paid

Step – 1

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$100 = \frac{P_1 + 5}{1 + 0.10}$$

$$P_1 = 110 - 5 = 105$$

Step – 2

Calculation of funds required

$$= [\text{Total Investment} - (\text{Net profit} - \text{Dividend})]$$

$$= 5,00,000 - (2,50,000 - 1,25,000)$$

$$= 3,75,000$$

Step – 3

No. of shares required to be issued for balance fund

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end (P}_1\text{)}}$$

$$\begin{aligned}\Delta n &= \frac{3,75,000}{105} \\ &= 3,571.4285\end{aligned}$$

Step – 4

Calculation of value of firm

$$\begin{aligned}V_f &= \frac{(n + \Delta n)P_1 - I + E}{(1 + K_e)} \\ V_f &= \frac{(25,000 + \frac{3,75,000}{105})105 - 5,00,000 + 2,50,000}{(1 + 0.10)} \\ &= ₹ 25,00,000\end{aligned}$$

Case 2 - When dividends are not paid**Step – 1**

$$\begin{aligned}P_0 &= \frac{P_1 + D_1}{1 + K_e} \\ 100 &= \frac{P_1 + 0}{1 + 0.10} \\ P_1 &= 110 - 0 = 110\end{aligned}$$

Step – 2

Calculation of funds required

$$\begin{aligned}&= [\text{Total Investment} - (\text{Net profit} - \text{Dividend})] \\ &= 5,00,000 - (2,50,000 - 0) \\ &= 2,50,000\end{aligned}$$

Step – 3

No. of shares required to be issued for balance fund

$$\text{No. of shares} = \frac{\text{Funds Required}}{\text{Price at end (P}_1\text{)}}$$

$$\begin{aligned}\Delta n &= \frac{2,50,000}{110} \\ &= 2,272.73\end{aligned}$$

Step – 4

Calculation of value of firm

$$\begin{aligned}V_f &= \frac{(n + \Delta n)P_1 - I + E}{(1 + K_e)} \\ V_f &= \frac{(25,000 + \frac{2,50,000}{110})110 - 5,00,000 + 2,50,000}{(1 + 0.10)} \\ &= ₹ 25,00,000\end{aligned}$$

Question – 35

Aakash Ltd. has 10 lakh equity shares outstanding at the start of the accounting year. The existing market price per share is ₹ 150. Expected dividend is ₹ 8 per share. The rate of capitalization appropriate to the risk class to which the company belongs is 10%.

- (i) CALCULATE the market price per share when expected dividends are: (a) declared, and (b) not declared, based on the Miller – Modigliani approach.
- (ii) CALCULATE number of shares to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹ 3 crore, investment budget is ₹ 6 crores, when (a) Dividends are declared, and (b) Dividends are not declared.
- (iii) PROOF that the market value of the shares at the end of the accounting year will remain unchanged irrespective of whether (a) Dividends are declared, or (ii) Dividends are not declared.

(Study Material ICAI TYK – 07)

Solution:

(i) Calculation of market price per share

According to Miller – Modigliani (MM) Approach:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

Where, Existing market price (P₀) = ₹ 150

Expected dividend per share (D₁) = ₹ 8

Capitalization rate (k_e) = 0.10

Market price at year end (P₁) = to be determined

(a) If expected dividends are declared, then

$$₹ 150 = \frac{P_1 + ₹ 8}{1 + 0.10}$$

$$\therefore P_1 = ₹ 157$$

(b) If expected dividends are not declared, then

$$₹ 150 = \frac{P_1 + 0}{1 + 0.10}$$

$$\therefore P_1 = ₹ 165$$

(ii) Calculation of number of shares to be issued

	(a) Dividends are declared (₹ lakh)	(b) Dividends are not declared (₹ lakh)
Net income	300	300
Total dividends	(80)	-
Retained earnings	220	300
Investment budget	600	600
Amount to be raised by new issues	380	300
Relevant market price (₹ per share)	157	165
No. of new shares to be issued (in lakh) (₹ 380 ÷ 157; ₹ 300 ÷ 165)	2.42	1.82

(iii) Calculation of market value of the shares

	(a) Dividends are declared	(b) Dividends are not declared
Existing shares (in lakhs)	10.00	10.00
New shares (in lakhs)	2.42	1.82
Total shares (in lakhs)	12.42	11.82
Market price per share (₹)	157	165
Total market value of shares at the end of the year (₹ in lakh)	12.42×157 = 1.950 (approx.)	11.82×165 = 1,950 (approx.)

Hence, it is proved that the total market value of shares remains unchanged irrespective of whether dividends are declared, or not declared.

Question – 36

SOC Ltd has 10 lakh equity shares outstanding at the beginning of the accounting year 2024. The existing market price per share is ₹ 600. Expected dividend is ₹ 40 per share. The rate of capitalization appropriate to the risk class to which the company belongs is 20%.

- (i) CALCULATE the market price per share by the end of the year when expected dividends are: (a) declared, and (b) not declared, based on the Miller – Modigliani approach.
- (ii) CALCULATE the number of shares to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹ 15 crore; investment budget is ₹ 20 crores, when (a) Dividends are declared, and (b) Dividends are not declared.
- (iii) PROVE that the market value of the shares at the end of the accounting year will remain unchanged irrespective of whether (a) Dividends are declared, or (ii) Dividends are not declared.

(MTP April – 2024)

Solution:**(i) Calculation of market price per share**

According to Miller – Modigliani (MM) Approach:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

Where,

Existing market price (P_0) = ₹ 600

Expected dividend per share (D_1) = ₹ 40

Capitalization rate (K_e) = 0.20

Market price at year end (P_1) = ?

a. If expected dividends are declared, then

$$600 = (P_1 + 40)/(1 + 0.2)$$

$$600 \times 1.2 = P_1 + 40$$

$$P_1 = 680$$

b. If expected dividends are not declared, then

$$600 = (P_1 + 0)/(1 + 0.2)$$

$$600 \times 1.2 = P_1$$

$$P_1 = 720$$

(ii) Calculation of number of shares to be issued

	(a)	(b)
	Dividends are declared (₹ lakh)	Dividends are not Declared (₹ lakh)
Net income	1500	1500
Total dividends	(400)	-
Retained earnings	1100	1500
Investment budget	2000	2000
Amount to be raised by new issues	900	500
Relevant market price (₹ per share)	680	720
No. of new shares to be issued (in lakh) (₹ 900 ÷ 680; ₹ 500 ÷ 720)	1.3235	0.6944

(iii) Calculation of market value of the shares

	(a) Particulars Dividends are declared	(b) Dividends are not Declared
Existing shares (in lakhs)	10.00	10.00
New shares (in lakhs)	1.3235	0.6944
Total shares (in lakhs)	11.3235	10.6944
Market price per share (₹)	680	720
Total market value of shares at the end of the year (₹ in lakh)	11.3235×680 $= 7,700$ (approx.)	10.6944×720 $= 7,700$ (approx.)

Hence, it is proved that the total market value of shares remains unchanged irrespective of whether dividends are declared, or not declared.

Question – 37

Roma Nov Ltd. has a capital of ₹ 25,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at ₹ 120. The company proposes to declare a dividend of ₹ 15 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 15%. COMPUTE market price of the share at the end of the year, if

- Dividend is not declared.
- Dividend is declared.

Assuming that the company pays the dividend and has net profits of ₹ 9,00,000 and makes new investments of ₹ 15,00,000 during the period, CALCULATE number of new shares to be issued? Use the MM model.

(MTP March – 2023)**Solution:****Given,**

Cost of Equity (K_e)	15 %
Number of shares in the beginning (n)	25,000
Current Market Price (P_0)	120
Net Profit (E)	9,00,000
Expected Dividend (D_1)	15
Investment (I)	15,00,000

Computation of market price per share, when:

- (i) No dividend is declared:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$₹120 = \frac{P_1 + 0}{1 + 0.15}$$

$$P_1 = ₹138 - 0 = ₹138$$

- (ii) Dividend is declared:

$$₹120 = \frac{P_1 + 15}{1 + 0.15}$$

$$P_1 = ₹138 - ₹15 = ₹123$$

Calculation of number of shares required for investment.

	₹
Earnings	9,00,000
Dividend distributed	3,75,000
Fund available for investment	12,75,000
Total Investment	15,00,000
Balance Funds required	15,00,000 – 12,75,000 = 2,25,000

$$\begin{aligned} \text{No. of shares} &= \frac{\text{Funds required}}{\text{price at the end (P}_1\text{)}} \\ &= \frac{2,25,000}{123} = 1,830 \text{ Shares (approx.)} \end{aligned}$$

Question – 38

ZX Ltd. has a paid-up share capital of ₹ 2,00,00,000, face value of ₹100 each. The current market price of the shares is ₹ 100 each. The Board of Directors of the company has an agenda of meeting to pay a dividend of 50% to its shareholders. The company expects a net income of ₹ 1,50,00,000 at the end of the current financial year. Company also plans for a capital expenditure for the next financial year for a cost of ₹ 1,90,00,000, which can be financed through retained earnings and issue of new equity shares.

Company's desired rate of investment is 15%.

Required:

Following the Modigliani- Miller (MM) Hypothesis, DETERMINE value of the company when:

- (i) It does not pay dividend and
- (ii) It does pay dividend

(MTP September – 2023)

Solution:

As per MM Hypothesis, value of firm/company is calculated as below:

V_f = Value of firm in the beginning of the period

n = number of shares in the beginning of the period

Δn = number of shares issued to raise the funds required

I = Amount required for investment

E = total earnings during the period

(i) Value of the ZX Ltd. when dividends are not paid.

$$nP_0 = \frac{(n + \Delta n) P_1 - I + E}{1 + K_e}$$

$$\begin{aligned} nP_0 &= \frac{\left[2,00,000 + \frac{4,00,000}{115}\right] \times 115 - ₹ 1,90,000 + ₹ 1,50,000}{1 + 0.15} \\ &= \frac{₹ 2,70,00,000 - ₹ 1,90,000 + ₹ 1,50,000}{(1 + 0.15)} = ₹ 2,00,00,000 \end{aligned}$$

Working notes:

1. Price of share at the end of the period (P_1)

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$100 = \frac{P_1 + 0}{1 + 0.15} \quad \text{or, } P_1 = 115$$

2. Calculation of funds required for investment

Earning	₹ 1,50,00,000
Dividend distributed	Nil
Fund available for investment	₹ 1,50,00,000
Total Investment	₹ 1,90,00,000
Balance Fund investment	₹ 40,00,000

3. Calculation of no. of shares required to be issued for balance fund

$$\text{No. of Share } (\Delta n) = \frac{\text{Fund Required}}{\text{Price at end } (p_1)} = \frac{40,00,000}{115} \text{ share}$$

(ii) Value of the ZX Ltd. when dividends are paid.

$$\begin{aligned} nP_0 &= \frac{(n + \Delta n) P_1 - I + E}{1 + K_e} \\ nP_0 &= \frac{\left(2,00,000 + \frac{1,40,00,000}{65}\right) \times ₹ 65 - ₹ 1,90,00,000 + ₹ 1,50,00,000}{1 + 0.15} \\ &= \frac{₹ 2,70,00,000 - ₹ 1,90,00,000 + ₹ 1,50,00,000}{(1 + 0.15)} = ₹ 2,00,00,000 \end{aligned}$$

Working notes:

4. Price of share at the end of the period (P_1)

$$\begin{aligned} P_0 &= \frac{P_1 + D_1}{1 + K_e} \\ 100 &= \frac{P_1 + 50}{1 + 0.15} \quad \text{or } P_1 = ₹ 65 \end{aligned}$$

5. Calculation of funds required for investment

Earning	1,50,00,000
Dividend distributed	1,00,00,000
Fund available for investment	50,00,000
Total Investment	1,90,00,000
Balance Fund required	1,40,00,000

6. Calculation of no. of shares required to be issued for balance fund

$$\begin{aligned}\text{No. of shares } (\Delta n) &= \frac{\text{Fund Required}}{\text{Price at the end } (P_1)} \\ &= \frac{1,40,00,000}{65} = 2,15,385 \text{ shares (approx.)}\end{aligned}$$

Note- As per MM-hypothesis of dividend irrelevance, value of firm remains same irrespective of dividend paid. In the solution, there may be variation in value, which is due to rounding off error.

Question – 39

Rambo Limited Has 1,00,000 equity shares outstanding for the year 2022. The current market price of the shares is ₹ 100 each. Company is planning to pay dividend of ₹ 10 per share. Required rate of return is 15%. Based on Modigliani-Miller approach, calculate the market price of the share of the company when the recommended dividend is 1) declared and 2) not declared.

How many new shares are to be issued by the company at the end of the year on the assumption that net income for the year is ₹ 40 Lac and the investment budget is ₹ 50,00,000 when dividend is declared, or dividend is not declared.

PROOF that the market value of the company at the end of the accounting year will remain same whether dividends are distributed or not distributed.

(RTP May – 2023)

Solution:

CASE 1: Value of the firm when dividends are not paid.

Step 1: Calculate price at the end of the period

$$K_e = 15\%, P_0 = ₹ 100, D_1 = 0$$

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$₹ 100 = \frac{P_1 + 0}{1 + 0.15}$$

$$P_1 = ₹ 115$$

Step 2: Calculation of funds required for investment

Earning	₹ 40,00,000
Dividend distributed	Nil

Fund available for investment	₹ 40,00,000
Total Investment	₹ 50,00,000
Balance Funds required	₹ 50,00,000 - ₹ 40,00,000 = ₹ 10,00,000

Step 3: Calculation of No. of shares required to be issued for balance funds

$$\text{No. of shares} = \text{Funds required} / P_1$$

$$\Delta n = ₹ 10,00,000 / ₹ 115$$

Step 4: Calculation of value of firm

$$nP_0 = [(n + \Delta n) P_1 - I + E] / (1 + K_e)$$

$$\begin{aligned} nP_0 &= [(1,00,000 + 10,00,000 / ₹ 115) ₹ 115 - ₹ 50,00,000 + ₹ 40,00,000] / (1.15) \\ &= ₹ 1,00,00,000 \end{aligned}$$

CASE 2: Value of the firm when dividends are paid.

Step 1: Calculate price at the end of the period

$$K_e = 15\%, P_0 = ₹ 100, D_1 = ₹ 10$$

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$₹ 100 = \frac{P_1 + 10}{1 + 0.15}$$

$$P_1 = ₹ 105$$

Step 2: Calculation of funds required for investment

Earning	₹ 40,00,000
Dividend distributed	₹ 10,00,000
Fund available for investment	₹ 30,00,000
Total Investment	₹ 50,00,000
Balance Funds required	₹ 50,00,000 - ₹ 30,00,000 = ₹ 20,00,000

Step 3: Calculation of No. of shares required to be issued for balance fund

$$\text{No. of shares} = \text{Funds Required} / P_1$$

$$\Delta n = ₹ 20,00,000 / ₹ 105$$

Step 4: Calculation of value of firm

$$nP_0 = [(n + \Delta n) P_1 - I + E] / (1 + K_e)$$

$$\begin{aligned} nP_0 &= [(1,00,000 + 20,00,000 / ₹ 105) ₹ 105 - ₹ 50,00,000 + ₹ 40,00,000] / (1.15) \\ &= ₹ 1,00,00,000 \end{aligned}$$

Thus, it can be seen from the above calculations that the value of the firm remains the same in either case.

Question – 40

MCO Ltd. has a paid-up share capital of ₹ 10,00,000, face value of ₹ 10 each. The current market price of the shares is ₹ 20 each. The Board of Directors of the company has an agenda of meeting to pay a dividend of 25% to its shareholders. The company expects a net income of ₹ 5,20,000 at the end of the current financial year. Company also plans for a capital expenditure for the next financial year for a cost of ₹ 7,50,000, which can be financed through retained earnings and issue of new equity shares.

Company's desired rate of investment is 15%.

Required:

Following the Modigliani- Miller (MM) Hypothesis, DETERMINE value of the company when:

- (i) It does not pay dividend and
- (ii) It does pay dividend

(RTP May – 2024)

Solution:

As per MM Hypothesis, value of firm/ company is calculated as below:

$$V_f \text{ or } nP_0 = \frac{(n + \Delta n)P_1 - I + E}{(1 + K_e)}$$

Where,

V_f = Value of firm in the beginning of the period

n = number of shares in the beginning of the period

Δn = number of shares issued to raise the funds required

I = Amount required for investment

E = total earnings during the period

(i) Value of the ZX Ltd. when dividends are not paid.

$$\begin{aligned}
 nP_0 &= \frac{(n + \Delta n)P_1 - I + E}{(1 + K_e)} \\
 nP_0 &= \frac{\left(1,00,000 + \frac{2,30,000}{23}\right) \times ₹ 23 - ₹ 7,50,000 + ₹ 5,20,000}{(1 + 0.15)} \\
 &= \frac{₹ 25,30,000 - ₹ 7,50,000 + ₹ 5,20,000}{(1 + 0.15)} = ₹ 20,00,000
 \end{aligned}$$

Working notes:

1. Price of share at the end of the period (P_1)

$$P_1 = \frac{P_1 + D_1}{1 + K_e}$$

$$20 = \frac{P_1 + 0}{1 + 0.15} \text{ Or, } P_1 = ₹ 23$$

2. Calculation of funds required for investment

Earnings	₹ 5,20,000
Dividend distributed	Nil
Fund available for investment	₹ 5,20,000
Total Investment	₹ 7,50,000
Balance Funds required	₹ 2,30,000

3. Calculation of no. of shares required to be issued for balance fund

$$\begin{aligned}
 \text{No. of shares } (\Delta n) &= \frac{\text{Funds required}}{\text{Price at end } P_1} = \frac{2,30,000}{23} \text{ shares} \\
 &= 10,000 \text{ shares}
 \end{aligned}$$

(ii) Value of the ZX Ltd. when dividends are paid.

$$nP_0 = \frac{(n + \Delta n)P_1 - I + E}{(1 + K_e)}$$

$$nP_0 = \frac{\left(1,00,000 + \frac{4,80,000}{20.5}\right) \times ₹ 20.5 - ₹ 7,50,000 + ₹ 5,20,000}{(1 + 0.15)}$$

$$= \frac{₹ 25,30,000 - ₹ 7,50,000 + ₹ 5,20,000}{(1 + 0.15)} = ₹ 20,00,000$$

Working notes:

4. Price of share at the end of the period (P_1)

$$P_1 = \frac{P_1 + D_1}{1 + K_e}$$

$$20 = \frac{P_1 + 2.5}{1 + 0.15} \text{ Or, } P_1 = ₹ 20.5$$

5. Calculation of funds required for investment

Earnings	₹ 5,20,000
Dividend distributed	₹ 2,50,000
Fund available for investment	₹ 2,70,000
Total Investment	₹ 7,50,000
Balance Funds required	₹ 4,80,000

6. Calculation of no. of shares required to be issued for balance fund

$$\text{No. of shares } (\Delta n) = \frac{\text{Funds required}}{\text{Price at end } P_1} = \frac{4,80,000}{20.5} \text{ shares}$$

$$= ₹ 23,415 \text{ shares (approx.)}$$

Question – 41

Aakash Ltd. has 10 lakh equity shares outstanding at the start of the accounting year 2021. The existing market price per share is ₹ 150. Expected dividend is ₹ 8 per share. The rate of capitalization appropriate to the risk class to which the company belongs is 10%.

- CALCULATE the market price per share when expected dividends are: (a) declared, and (b) not declared, based on the Miller – Modigliani approach.
- CALCULATE number of shares to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹ 3 crore, investment budget is ₹ 6 crores, when (a) Dividends are declared, and (b) Dividends are not declared.

- (iii) PROOF that the market value of the shares at the end of the accounting year will remain unchanged irrespective of whether (a) Dividends are declared, or (ii) Dividends are not declared.

(RTP Nov – 2021)**Solution:****(i) Calculation of market price per share**

According to Miller – Modigliani (MM) Approach:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

Where,

Existing market price (P_0) = 150

Expected dividend per share (D_1) = 8

Capitalization rate (K_e) = 0.10

Market price at year end (p_1) = to be determined

- (a) If expected dividends are declared, then

$$₹ 150 = \frac{P_1 + ₹ 8}{1 + 0.10}$$

$$\therefore P_1 = ₹ 157$$

- (b) If expected dividends are not declared, then

$$₹ 150 = \frac{P_1 + 0}{1 + 0.10}$$

$$\therefore P_1 = ₹ 165$$

(ii) Calculation of number of shares to be issued

	(a)	(b)
	Dividends are declared	Dividends are not Declared

	(₹lakh)	(₹lakh)
Net income	300	300
Total dividends	(80)	-
Retained earnings	220	300
Investment budget	600	600
Amount to be raised by new issues	380	300
Relevant market price (per share)	157	165
No. of new shares to be issued (in lakh) ($₹ 380 \div 157$; $₹ 300 \div 165$)	2.42	1.82

(iii) Calculation of market value of the shares

	(a)	(b)
	Dividends are declared	Dividends are not Declared
Existing shares (in lakhs)	10.00	10.00
New shares (in lakhs)	2.42	1.82
Total shares (in lakhs)	12.42	11.82
Market price per share (₹)	157	165
Total market value of shares at the end of the year (in lakh)	12.42×157 = 1,950 (approx.)	11.82×165 = 1,950 (approx.)

Hence, it is proved that the total market value of shares remains unchanged irrespective of whether dividends are declared, or not declared.

Question – 42

Ordinary shares of a listed company are currently trading at ₹ 10 per share with two lakh shares outstanding. The company anticipates that its earnings for next year will be ₹ 5,00,000. Existing cost of capital for equity shares is 15%. The company has certain investment proposals under discussion which will cause an additional 26,089 ordinary shares to be issued if no dividend is paid or an additional 47,619 ordinary shares to be issued if dividend is paid.

Applying the MM hypothesis on dividend decisions, CALCULATE the amount of investment and dividend that is under consideration by the company.

(RTP Nov – 2022)

Solution:

$$P_0 = ₹ 10, n = 2,00,000, E = ₹ 5,00,000$$

$$K_e = 15\%, \Delta n = 26,089, I = ?$$

$$P_0 = \frac{P_1}{1 + K_e}$$

$$10 = \frac{P_1}{1.15}$$

$$\therefore P_1 = 11.5$$

$$\Delta n = \frac{I - E + nD_1}{P_1}$$

$$26,089 = \frac{I - 5,00,000}{11.5}$$

$$I = 8,00,024$$

Now,

$$P_0 = ₹ 10, n = ₹ 2,00,000,$$

$$E = ₹ 5,00,000, I = 8,00,024,$$

$$K_e = 15\%, \Delta n = 47,619, D_1 = ?$$

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$10 = \frac{P_1 + D_1}{1.15}$$

$$P_1 + D_1 = 11.5$$

$$\therefore P_1 = 11.5 - D_1 \dots\dots\dots 1$$

$$\therefore \Delta n = \frac{I - E + nD_1}{P_1}$$

$$47,619 = \frac{8,00,024 - 5,00,000 + 2,00,000D_1}{P_1}$$

$$47,619 P_1 = 2,00,000 D_1 + 3,00,024$$

From 1,

$$47619 (11.5 - D_1) = 2,00,000 D_1 + 3,00,024$$

$$5,47,618.5 - 47,619 D_1 = 2,00,000 D_1 + 3,00,024$$

$$\therefore 2,47,594.5 = 2,00,000 D_1 + 47,619 D_1$$

$$\therefore 2,47,594.5 = 2,47,619 D_1$$

$$\therefore D_1 = \frac{2,47,594.5}{2,47,619} = 0.99 \approx ₹ 1$$

$$\therefore P_1 = 11.5 - D_1$$

$$P_1 = 11.5 - 1$$

$$P_1 = 10.5$$

$$\begin{aligned} \therefore n. P_0 &= \frac{(n - \Delta n) P_1 - I + E}{1 + K_e} \\ &= \frac{(2,00,000 + 47,619)(10.5) - 8,00,024 + 5,00,000}{1.15} \end{aligned}$$

$$n. P_0 = ₹ 19,99,979 \approx ₹ 20,00,000$$

Using direct calculation,

$$n. P_0 = 2,00,000 \times 10 = ₹ 20,00,000$$

(4) RESIDUAL

Question – 43

Mr H is currently holding 1,00,000 shares of HM ltd, and currently the share of HM ltd is trading on Bombay Stock Exchange at ₹ 50 per share. Mr A have a policy to re-invest the amount of any dividend received into the shared back again of HM ltd. If HM ltd has declared a dividend of ₹ 10 per share, please determine the no of shares that Mr A would hold after he re-invests dividend in shares of HM ltd.

(Study Material ICAI TYK – 08)

Solution:

Ex-dividend price is ₹ 40 (50-10).

The total amount of dividend received is ₹ 10,00,000 which is re-invested at the rate of ₹ 40 per share.

Hence additional shares purchased would be 25,000.

Total holding would be 1,25,000 shares (1,00,000 + 25,000)

Question – 44

Following information is given pertaining to DG Ltd,

No of shares outstanding	1 lakh shares
Earnings Per share	25 per share
P/E Ratio	20
Book Value per share	400 per share

If company decides to repurchase 25,000 shares, at the prevailing market price, what is the resulting book value per share after repurchasing.

(Study Material ICAI TYK – 09)

Solution:

Current Market price = $20 \times 25 = 500$ per share

Book value of the company before repurchase = ₹ 4 cr (400×1 lakh shares)

Amount paid for repurchase = 1.25 cr ($25,000$ shares $\times$ 500 per share)

Book Value of company after repurchase = ₹ 2.75 cr ($4\text{cr} - 1.25\text{cr}$)

No of shares after repurchase = 75,000 shares

Book value per share = 367 per share.

Question – 45

HM Ltd. is listed on Bombay Stock Exchange which is currently been evaluated by Mr. A on certain parameters.

Mr. A collated following information:

- (a) The company generally gives a quarterly interim dividend. ₹ 2.5 per share is the last dividend declared.
- (b) The company's sales are growing by 20% on a 5-year Compounded Annual Growth Rate (CAGR) basis, however the company expects following retention amounts against probabilities mentioned as contention is dependent upon cash requirements for the company. Rate of return is 10% generated by the company.

Situation	Prob.	Retention Ratio
A	30 %	50 %
B	40 %	60 %
C	30 %	50 %

- (c) The current risk-free rate is 3.75% and with a beta of 1.2 company is having a risk premium of 4.25%.

You are required to help Mr. A in calculating the current market price using Gordon's formula.

(RTP Nov – 2023)

Solution:

Market price using Gordon's formula

$$P_0 = \frac{D_0 (1 + g)}{K_e - g}$$

$$D_0 = 2.5 \times 4 = 10 \text{ per share (annual)}$$

$$g = \text{br or retention ratio} \times \text{rate of return}$$

Calculation of expected retention ratio

Situation	Prob.	Retention Ratio	Expected Retention Ratio
A	30%	50%	0.15
B	40%	60%	0.24
C	30%	50%	0.15
Total			0.54

$$g = 0.54 \times 0.10 = 0.054 \text{ or } 5.4\%$$

$$P_0 = \frac{D_0 (1 + g)}{K_e - g}$$

$$P_0 = \frac{10 (1 + 0.054)}{0.0885 - 0.054} = \frac{10.54}{0.0345} = 305.51$$

$$\begin{aligned} K_e &= \text{Risk free rate} + (\text{Beta} \times \text{Risk Premium}) \\ &= 3.75\% + (1.2 \times 4.25\%) = 8.85\% \end{aligned}$$

Question – 46

Following information are given for a company:

Earnings per share	₹ 10
P/E Ratio	12.5
Rate of return on investment	12%
Market price per shares as per Walter's Model	₹ 130

You are required to calculate:

- Dividend payout ratio.
- Market price of share at optimum dividend payout ratio.
- P/E ratio, at which the dividend policy will have no effect on the price of share.
- Market price of share at this P/E ratio.
- Market price of share using Dividend growth model.

(Exam, May – 2023)

Solution:

- (i) The EPS of the firm is ₹ 10, $r = 12\%$. The P/E Ratio is given at 12.5 and the cost of capital (K_e) may be taken as the inverse of P/E ratio. Therefore, K_e is 8% (i.e., $1/12.5$). The value of the share is ₹ 130 which may be equated with Walter Model as follows:

$$P = \frac{D + \frac{r}{K_e} (E - D)}{K_e} \text{ or } P = \frac{D + \frac{12\%}{8\%} (10 - D)}{8\%}$$

$$\text{or } [D + 1.5(10 - D)] / 0.08 = 130$$

$$\text{or } D + 15 - 1.5D = 10.4$$

$$\text{or } -0.5D = -4.6$$

$$\text{So, } D = ₹ 9.2$$

The firm has a dividend pay-out of 92% (i.e., $9.2/10$).

- (ii) Since the rate of return of the firm (r) is 12% and it is more than the K_e of 8%, therefore, by distributing 92% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be:

$$P = \frac{0 + \frac{12\%}{8\%} (10 - 0)}{8\%}$$

$$P = ₹ 187.5$$

So, theoretically the market price of the share can be increased by adopting a zero pay-out.

- (iii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the K_e would be equal to the rate of return (r) of the firm. The K_e would be 12% ($= r$) at the P/E ratio of $1/12\% = 8.33$. Therefore, at the P/E ratio of 8.33, the dividend policy would have no effect on the value of the share.
- (iv) If the P/E is 8.33 instead of 12.5, then the K_e which is the inverse of P/E ratio, would be 12% and in such a situation $K_e = r$ and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{K_e} (E - D)}{K_e} = \frac{9.2 + \frac{0.12}{0.12} (10 - 9.2)}{0.12} = ₹ 83.33$$

- (v) Dividend Growth Model applying growth on dividend

$$K_e = 8\%, r = 12\%, D_0 = 9.2, b = 0.08$$

$$g = b.r$$

$$g = 0.08 \times 0.12 = 0.96\%$$

$$D_1 = D_0 (1 + g) = 9.2 (1 + 0.0096) = ₹ 9.2883$$

$$P = \frac{D_1}{K_e - g} = 9.2883 / (0.08 - 0.0096) = 9.2883 / 0.0704 = ₹ 131.936$$

Alternative**Alternatively, without applying growth on dividend**

$$P = \frac{E(1-b)}{K_e - b_r} = \frac{10(1-0.08)}{0.08 - (0.08 \times 0.12)} = ₹ 130.68$$

Question – 47

- (i) EPS of a company is ₹ 60 and Dividend payout ratio is 60%. Multiplier is 5. Determine price per share as per Graham & Dodd model.
- (ii) Last year's dividend is ₹ 6.34, adjustment factor is 45%, target payout ratio is 60% and current year's EPS is ₹ 12. Compute current year's dividend using Linter's model.

(Exam, Nov – 2023)**Solution:**

(i) Price per share (P) = $m \left(D + \frac{E}{3} \right)$

Where,

m = Multiplier

D = Dividend

E = EPS

$$P = 5 \left(60 \times 0.6 + \frac{60}{3} \right)$$

$$P = 5(36 + 20) = ₹ 280$$

(ii) $D_1 = D_0 + [(EPS \times \text{Target payout}) - D_0] \times \text{Adjustment factor}$

$$D_1 = 6.34 + [(12 \times 60\%) - 6.34] \times 0.45$$

$$D_1 = 6.34 + 0.387 = ₹ 6.727$$

Question – 48

INFO Ltd is a listed company having share capital of ₹ 2,400 Crores of ₹ 5 each.

During the year 2022-23

Dividend distributed	1000%
Expected Annual growth rate in dividend	14%
Expected rate of return on its equity capital	18%

Required:

- (a) Calculate price of share applying Gordon's growth Model.
- (b) What will be the price of share if the Annual growth rate in dividend is only 10%?
- (c) According to Gordon's growth Model, if Internal Rate of Return is 25%, then what should be the optimum dividend payout ratio in case of growing stage of company? Comment.

(Exam, Nov – 2023)

Solution:

- (a) In the present situation, the current MPS is as follows:

$$P = \frac{D_0 (1 + g)}{K_e - g}$$

Where

P = Market price per share

D_0 = Current year dividend

g = Growth rate of dividends

K_e = Cost of equity capital/ expected rate of return

$$P = \frac{50 (1 + 0.14)}{0.18 - 0.14} = ₹ 1425$$

- (b) The impact of changes in growth rate to 10% on MPS will be as follows:

$$P = \frac{50 (1 + 0.10)}{0.18 - 0.10} = ₹ 687.5$$

- (c) If Internal rate of return, $r = 25\%$ and $K_e = 18\%$

As per Gordon's model, when $r > K_e$, optimum dividend payout ratio is 'Zero'. When IRR is greater than cost of capital, the price per share increases and dividend payout decreases.

Question – 49

Vista Limited's retained earnings per share for the year ending 31.03.2023 being 40% is ₹ 3.60 per share. Company is foreseeing a growth rate of 10% per annum in the next two years. After that the growth rate is expected to stabilize at 8% per annum. Company will maintain its existing pay-out ratio. If the investor's required rate of return is 15%, Calculate the intrinsic value per share as of date using dividend discount model.

(Exam, May – 2024)

Multiple Choice Questions (MCQs)

1. Which one of the following is the assumption of Gordon's Model:
 - (a) $K_e > g$
 - (b) Retention ratio, (b), once decide upon, is constant
 - (c) Firm is an all equity firm
 - (d) All of the above
2. What should be the optimum Dividend pay-out ratio, when $r = 15\%$ & $K_e = 12\%$:
 - (a) 100%
 - (b) 50%
 - (c) Zero
 - (d) None of the above.
3. Which of the following is the irrelevance theory?
 - (a) Walter model

- (b) Gordon model
 - (c) M.M. hypothesis
 - (d) Linter's model
4. If the company's D/P ratio is 60% & ROI is 16%, what should be the growth rate?
- (a) 5%
 - (b) 7%
 - (c) 6.4%
 - (d) 9.6%
5. If the shareholders prefer regular income, how does this affect the dividend decision:
- (a) It will lead to payment of dividend
 - (b) It is the indicator to retain more earnings
 - (c) It has no impact on dividend decision
 - (d) Can't say
6. Mature companies having few investment opportunities will show high payout ratios, this statement is:
- (a) False
 - (b) True
 - (c) Partial true
 - (d) None of these
7. Which of the following is the limitation of Linter's model?
- (a) This model does not offer a market price for the shares.
 - (b) The adjustment factor is an arbitrary number and not based on any scientific criterion or methods.
 - (c) Both (a) & (b)

- (d) None of the above.
8. What are the different options other than cash used for distributing profits to shareholders?
- (a) Bonus shares
(b) Stock split
(c) Both (a) and (b)
(d) None of the above
9. Which of the following statement is correct with respect to Gordon's model?
- (a) When IRR is greater than cost of capital, the price per share increases and dividend pay-out decreases.
(b) When IRR is greater than cost of capital, the price per share decreases and dividend pay-out increases.
(c) When IRR is equal to cost of capital, the price per share increases and dividend pay-out decreases.
(d) When IRR is lower than cost of capital, the price per share increases and dividend pay-out decreases.
10. Compute EPS according to Graham & Dodd approach from the given information:
- | | |
|------------------------|------|
| Market Price | ₹ 56 |
| Dividend Pay-out Ratio | 60% |
| Multiplier | 2 |
- (a) ₹ 30
(b) ₹ 56
(c) ₹ 28
(d) ₹ 84
11. Which among the following is not an assumption of Walter's Model?

- (a) Rate of return and cost of capital are constant
- (b) Information is freely available to all
- (c) There is discrimination in taxes
- (d) The firm has perpetual life

CHAPTER – 07

MANAGEMENT OF WORKING CAPITAL

(1) WORKING CAPITAL**Question – 01**

From the following information of XYZ Ltd., you are required to calculate:

- Net operating cycle period.
- Number of operating cycles in a year.

		(₹)
i	Raw material inventory consumed during the year	6,00,000
ii	Average stock of raw material	50,000
iii	Work-in-progress inventory	5,00,000
iv	Average work-in-progress inventory	30,000
v	Finished goods inventory	8,00,000
vi	Average finished goods stock held	40,000
vii	Average collection period from debtors	45 days
viii	Average credit period availed	30 days
ix	No. of days in a year	360 days

(Study Material ICAI Illus – 02)

Solution:**(a) Calculation of Net Operating Cycle period of XYZ Ltd.**

Raw Material storage period (R) =

$$\begin{aligned}
 & \frac{\text{Average Stock of Raw Material}}{\text{Average Cost of Raw Material Consumption Per day}} \\
 &= \frac{₹ 50,000}{₹ 6,00,000 \div 360 \text{ days}} = \frac{₹ 50,000}{1,667} = 30 \text{ days}
 \end{aligned}$$

Work-in-progress inventory holding period (W)

$$\begin{aligned} &= \frac{\text{Average Work-in-progress inventory}}{\text{Average Cost of Production per day}} \\ &= \frac{₹ 30,000}{₹ 5,00,000 \div 360 \text{ days}} = \frac{₹ 30,000}{1,389} = 22 \text{ days} \end{aligned}$$

Finished Goods storage period (F)

$$\begin{aligned} &= \frac{\text{Average Stock of Finished Goods}}{\text{Average Cost of Goods Sold per day}} \\ &= \frac{₹ 40,000}{₹ 8,00,000 \div 360 \text{ days}} = \frac{₹ 40,000}{2,222} = 18 \text{ days} \end{aligned}$$

Receivables (Debtors) collection period (D) = 45 days

Credit Period allowed by creditors © = 30 days

Net Operating Cycle = R + W + F + D – C = 30 + 22 + 18 + 45 – 30
= 85 day

$$\begin{aligned} \text{(b) Number of Operating Cycle s in a year} &= \frac{\text{No. of days in a year}}{\text{Operating Cycle Period}} \\ &= \frac{360 \text{ days}}{85 \text{ days}} = 4.23 \text{ times} \end{aligned}$$

Question – 02

On 1st January, the Managing Director of Naureen Ltd. wishes to know the amount of working capital that will be required during the year. From the following information prepare the working capital requirements forecast.

Production during the previous year was 60,000 units. It is planned that this level of activity would be maintained during the present year. The expected ratios of the cost to selling prices are Raw materials 60%, Direct wages 10% and Overheads 20%.

Raw materials are expected to remain in store for an average of 2 months before issue to production.

Each unit is expected to be in process for one month, the raw materials being fed into the pipeline immediately and the labour and overhead costs accruing evenly during the month.

Finished goods will stay in the warehouse awaiting dispatch to customers for approximately 3 months.

Credit allowed by creditors is 2 months from the date of delivery of raw material.

Credit allowed to debtors is 3 months from the date of dispatch.

Selling price is ₹ 5 per unit.

There is a regular production and sales cycle.

Wages and overheads are paid on the 1st of each month for the previous month.

The company normally keeps cash in hand to the extent of ₹ 20,000.

(Study Material ICAI Illus – 03)

Solution:

Working Notes:

1. **Raw material inventory:** The cost of materials for the whole year is 60% of the Sales value.

$$\text{Hence it is } 60,000 \text{ units} \times ₹ 5 \times \frac{360 \text{ days}}{85 \text{ days}} = 1,80,000.$$

The monthly consumption of raw material would be ₹ 15,000. Raw material requirements would be for two months; hence raw materials in stock would be ₹ 30,000.

2. **Work-in-process:** (Students may give special attention to this point). It is stated that each unit of production is expected to be in process for one month).

		(₹)
(a)	Raw materials in work-in-process (being one month's raw material requirements)	15,000
(b)	Labour costs in work-in-process (It is stated that it accrues evenly during the month. Thus, on the first day	1,250

	of each month it would be zero and on the last day of month the work-in-process would include one month's labour costs. On an average therefore, it would be equivalent to $\frac{1}{2}$ of the month's labour costs) $\left(\frac{10\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 0.5 \text{ Months} \right)$	
(c)	Overheads (For $\frac{1}{2}$ month as explained above) $\left(\frac{20\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 0.5 \text{ Months} \right)$	2,500
	Total work-in-process	18,750

3. Finished goods inventory: (3 month's cost of production)

Raw Materials $\left(\frac{60\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 3 \text{ Months} \right)$	45,000
Labour $\left(\frac{10\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 3 \text{ Months} \right)$	7,500
Overheads $\left(\frac{20\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 3 \text{ Months} \right)$	15,000
Total finished goods inventory	67,500
Alternatively, $(60,000 \text{ units} \times ₹ 5 \times 90\%) \times 3/12$	67,500

4. Debtors: The total cost of sales = 2,70,000.

$$\text{Therefore, debtors} = ₹ 2,70,000 \times \frac{3}{12} = ₹ 67,500$$

Where, Total Cost of Sales = RM + Wages + Overheads + Opening Finished goods inventory – Closing finished goods inventory.

$$= ₹ 1,80,000 + ₹ 30,000 + ₹ 60,000 + ₹ 67,500 - ₹ 67,500 = ₹ 2,70,000.$$

5. Creditors: Suppliers allow a two months' credit period. Hence, the average amount of creditors would be two months consumption of raw materials i.e.

$$\left(\frac{60\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 2 \text{ Months} \right) = ₹ 30,000.$$

6. Direct Wages payable: $\left(\frac{10\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 1 \text{ Months} \right) = ₹ 2,500.$

7. **Overheads Payable:** $\left(\frac{20\% \text{ of } (60,000 \times ₹ 5)}{12 \text{ Months}} \times 1 \text{ Months} \right) = ₹ 5,000$

Here it has been assumed that inventory level is uniform throughout the year, therefore opening inventory equals closing inventory.

Statement of Working Capital Required

	(₹)	(₹)
Current Assets or Gross Working Capital:		
Raw materials inventory (Refer to working note 1)	30,000	
Working-in-process (Refer to working note 2)	18,750	
Finished goods inventory (Refer to working note 3)	67,500	
Debtors (Refer to working note 4)	67,500	
Cash	20,000	2,03,750
Current Liabilities:		
Creditors (Refer to working note 5)	30,000	
Direct wages payable (Refer to working note 6)	2,500	
Overheads payable (Refer to working note 7)	5,000	(37,500)
Estimated working capital requirements		1,66,250

Question – 03

The following annual figures relate to XYZ Co.,

	(₹)
Sales (at two months' credit)	36,00,000
Materials consumed (suppliers extend two months' credit)	9,00,000
Wages paid (1 month lag in payment)	7,20,000
Cash manufacturing expenses (expenses are paid one month in arrear)	9,60,000
Administrative expenses (1 month lag in payment)	2,40,000
Sales promotion expenses (paid quarterly in advance)	1,20,000

The company sells its products on gross profit of 25%. Depreciation is considered as a part of the cost of production. It keeps one month's stock each of raw materials and finished goods, and a cash balance of ₹ 1,00,000.

Assuming a 20% safety margin, work out the working capital requirements of the company on cash cost basis. Ignore work-in-process.

(Study Material ICAI Illus – 04)

Solution:

Statement of Working Capital requirements (cash cost basis)

	(₹)	(₹)
A. Current Assets		
Inventory:		
- Raw materials $\left(\frac{₹ 9,00,000}{12 \text{ Months}} \times 1 \text{ month}\right)$	75,000	
- Finished Goods $\left(\frac{₹ 25,80,000}{12 \text{ Months}} \times 1 \text{ month}\right)$	2,15,000	
- Receivables (Debtors) $\left(\frac{₹ 29,40,000}{12 \text{ Months}} \times 2 \text{ months}\right)$	4,90,000	
- Sales Promotion expenses paid in advance $\left(\frac{₹ 1,20,000}{12 \text{ Months}} \times 3 \text{ months}\right)$	30,000	
Cash Balance	1,00,000	9,10,000
Gross Working Capital		9,10,000
B. Current Liabilities:		
Payables:		
- Creditors for materials $\left(\frac{₹ 9,00,000}{12 \text{ Months}} \times 2 \text{ months}\right)$	1,50,000	
- Wages outstanding $\left(\frac{₹ 7,20,000}{12 \text{ Months}} \times 1 \text{ month}\right)$	60,000	
- Manufacturing expenses outstanding $\left(\frac{₹ 9,60,000}{12 \text{ Months}} \times 1 \text{ month}\right)$	80,000	
- Administrative expenses outstanding $\left(\frac{₹ 2,40,000}{12 \text{ Months}} \times 1 \text{ month}\right)$	20,000	3,10,000
Net working capital (A - B)		6,00,000
Add: Safety margin @ 20%		1,20,000
Total Working Capital requirements		7,20,000

Working Notes:

(i) Computation of Annual Cash Cost of Production	(₹)
Material consumed	9,00,000
Wages	7,20,000
Manufacturing expenses	9,60,000
Total cash cost of production	25,80,000
(ii) Computation of Annual Cash Cost of Sales:	(₹)

Total Cash cost of production as in (i) above	25,80,000
Administrative Expenses	2,40,000
Sales promotion expenses	1,20,000
Total cash cost of sales	29,40,000

Question – 04

Samreen Enterprises has been operating its manufacturing facilities till 31.3.2017 on a single shift working with the following cost structure:

	Per unit (₹)
Cost of Materials	6.00
Wages (out of which 40% fixed)	5.00
Overheads (out of which 80% fixed)	5.00
Profit	2.00
Selling Price	18.00
Sales during 2016-17– ₹ 4,32,000	

As at 31.3.2017 the company held:

	(₹)
Stock of raw materials (at cost)	36,000
Work-in-progress (valued at prime cost)	22,000
Finished goods (valued at total cost)	72,000
Sundry debtors	1,08,000

In view of increased market demand, it is proposed to double production by working an extra shift. It is expected that a 10% discount will be available from suppliers of raw materials in view of increased volume of business. Selling price will remain the same. The credit period allowed to customers will remain unaltered. Credit availed of from suppliers will continue to remain at the present level i.e., 2 months. Lag in payment of wages and expenses will continue to remain half a month.

You are required to assess the additional working capital requirements, if the policy to increase output is implemented.

(Study Material ICAI Illus – 05)

Solution:

This question can be solved using two approaches:

- To assess the impact of double shift for long term as a matter of production policy.

- (ii) To assess the impact of double shift to mitigate the immediate demand for next year only.

The first approach is more appropriate and fulfilling the requirement of the question.

- (i) **Assessment of impact of double shift for long term as a matter of production policy:**

Comparative Statement of Working Capital Requirement

	Single Shift (24,000)			Double Shift (48,000)		
	Unit	Rate (₹)	Amount (₹)	Unit	Rate (₹)	Amount (₹)
Current Assets						
Inventories:						
Raw Materials	6,000	6.00	36,000	12,000	5.40	64,800
Work-in-Progress	2,000	11.00	22,000	2,000	9.40	18,800
Finished Goods	4,500	16.00	72,000	9,000	12.40	1,11,600
Sundry Debtors	6,000	16.00	96,000	12,000	12.40	1,48,800
Total Current Assets: (A)			2,26,000			3,44,000
Current Liabilities						
Creditors for Materials	4,000	6.00	24,000	8,000	5.40	43,200
Creditors for Wages	1,000	5.00	5,000	2,000	4.00	8,000
Creditors for Expenses	1,000	5.00	5,000	2,000	3.00	6,000
Total Current Liabilities: (B)			34,000			57,200
Working Capital: (A) – (B)			1,92,000			2,86,800

Additional Working Capital requirement = ₹ 2,86,800 – ₹ 1,92,000 = ₹ 94,800

Workings:

- (1) Statement of cost at single shift and double shift working

	24,000 units		48,000 Units	
	Per unit (₹)	Total (₹)	Per unit (₹)	Total (₹)
Raw materials	6.00	1,44,000	5.40	2,59,200
1. Wages – Variable	3.00	72,000	3.00	1,44,000
Fixed	2.00	48,000	1.00	48,000

Overheads – Variable	1.00	24,000	1.00	48,000
Fixed	4.00	96,000	2.00	96,000
Total cost	16.00	3,84,000	12.40	5,95,200
Profit	2.00	48,000	5.60	2,68,800
	18.00	4,32,000	18.00	8,64,000

$$(2) \text{ Sales in units 2020-21} = \frac{\text{Sales}}{\text{Unit Selling Price}} = \frac{\text{₹ 4,32,000}}{\text{₹ 18}} = 24,000 \text{ units}$$

$$(3) \text{ Stock of Raw Materials in units on 31.03.2021}$$

$$= \frac{\text{Value of Stock}}{\text{Cost per unit}} = \frac{\text{₹ 36,000}}{6} = 6,000 \text{ units}$$

$$(4) \text{ Stock of work-in-progress in units on 31.3.2021}$$

$$= \frac{\text{Value of work-in-progress}}{\text{Prime Cost per unit}} = \frac{\text{₹ 22,000}}{(\text{₹ 6} + \text{₹ 5})} = 2,000 \text{ units}$$

$$(5) \text{ Stock of finished goods in units 2020-21}$$

$$= \frac{\text{Value of Stock}}{\text{Total Cost per unit}} = \frac{\text{₹ 72,000}}{\text{₹ 16}} = 4,500 \text{ units}$$

(ii) Assessment of the impact of double shift to mitigate the immediate demand for next year only & not as part of policy implementation.

In this approach, working capital shall be computed as if we are calculating the same for the next / second year with double production. Whereas, in the first approach to implement double-shift as part of policy implementation, we calculated comparative analysis of working capital requirement for single & double shift within the same year.

Workings:

$$(6) \text{ Calculation of no. of units to be sold:}$$

No. of units to be Produced	48,000
Add: Opening stock of finished goods	4,500
Less: Closing stock of finished goods	(9,000)
No. of units to be Sold	43,500

- (7) Calculation of Material to be consumed and materials to be purchased in units:

No. of units Produced	48,000
Add: Closing stock of WIP	2,000
Less: Opening stock of WIP	(2,000)
Raw Materials to be consumed in units	48,000
Add: Closing stock of Raw material	12,000
Less: Opening stock of Raw material	(6,000)
Raw Materials to be purchased (in units)	54,000

- (8) Credit allowed by suppliers:

$$= \frac{\text{No. of units to purchased} \times \text{Cost per unit}}{12 \text{ Months}} \times 2 \text{ months}$$

$$= \frac{54,000 \times ₹ 5.40}{12 \text{ Months}} \times 2 \text{ months} = ₹ 48,600$$

Comparative Statement of Working Capital Requirement

	Single Shift (Current Year – 24,000 units)			Double Shift (Next Year – 48,000 units)		
	Unit	Rate (₹)	Amount (₹)	Unit	Rate (₹)	Amount (₹)
Current Assets						
Inventories:						
Raw Materials	6,000	6.00	36,000	12,000	5.40	64,800
Work-in-Progress	2,000	11.00	22,000	2,000	9.40	18,800
Finished Goods	4,500	16.00	72,000	9,000	12.40	1,11,600
Sundry Debtors	6,000	16.00	96,000	12,000	12.40	1,48,800
Total Current Assets: (A)			2,26,000			3,44,000
Current Liabilities						
Creditors for Materials	4,000	6.00	24,000	9,000	5.40	48,600
Creditors for Wages	1,000	5.00	5,000	2,000	4.00	8,000
Creditors for Expenses	1,000	5.00	5,000	2,000	3.00	6,000
Total Current Liabilities: (B)			34,000			62,600
Working Capital: (A) – (B)			1,92,000			2,81,400

Additional Working Capital requirement = ₹ 2,81,400 – ₹ 1,92,000 = ₹ 89,400

Notes:

- (i) The quantity of material in process will not change due to double shift working since work started in the first shift will be completed in the second shift.
- (ii) It is given in the question that the WIP is valued at prime cost hence, it is assumed that the WIP is 100% complete in respect of material and labour.
- (iii) In absence of any information on proportion of credit sales to total sales, debtors quantity has been doubled for double shift. Hence, the units have been taken as 12,000 only.
- (iv) It is assumed that all purchases are on credit.
- (v) The valuation of work-in-progress based on prime cost (i.e. material & labor) as per the policy of the company is as under.

	Single Shift (₹)	Double Shift (₹)
Materials	6.00	5.40
Wages – Variable	3.00	3.00
Fixed	2.00	1.00
	11.00	9.40

Question – 05

Following information is forecasted by R Limited for the year ending 31st March, 2021:

	Balance as at 31 st March, 2021 (₹ in lakh)	Balance as at 31 st March, 2020 (₹ in lakh)
Raw Material	65	45
Work-in-progress	51	35
Finished goods	70	60
Receivables	135	112
Payables	71	68
Annual purchases of raw material (all credit)	400	
Annual cost of production	450	
Annual cost of goods sold	525	
Annual operating cost	325	

Annual sales (all credit)	585
---------------------------	-----

You may take one year as equal to 365 days.

You are required to CALCULATE:

- (i) Net operating cycle period.
- (ii) Number of operating cycles in the year.
- (iii) Amount of working capital requirement.

(Study Material ICAI TYK – 01)

Solution:

Working Notes:

1. Raw Material Storage Period (R)

$$= \frac{\text{Average Stock of Raw Material}}{\text{Annual Consumption Raw Material}} \times 365$$

$$= \frac{\frac{₹ 45 + ₹ 65}{2}}{₹ 380} \times 365 = 52.38 \text{ or } 53 \text{ days}$$

Annual Consumption of Raw Material

= Opening Stock + Purchase – Closing Stock

= ₹ 45 + ₹ 400 – ₹ 65 = ₹ 380 lakh

2. Work in Progress (WIP) Conversion Period (W)

$$= \frac{\text{Average Stock of WIP}}{\text{Annual Cost of Production}} \times 365$$

$$= \frac{\frac{₹ 35 + ₹ 51}{2}}{₹ 450} \times 365 = 34.87 \text{ or } 35 \text{ days}$$

3. Finished Stock Storage Period (F)

$$= \frac{\text{Average Stock of Finished Goods}}{\text{Cost of Goods Sold}} \times 365$$

$$= \frac{\frac{₹ 60 + ₹ 70}{2}}{₹ 525} \times 365 = 45.19 \text{ or } 45 \text{ days}$$

4. Receivables (Debtors) Collection Period (D)

$$= \frac{\text{Average Receivables}}{\text{Annual Credit Sales}} \times 365$$

$$= \frac{\frac{₹ 112 + ₹ 135}{2}}{₹ 585} \times 365 = 77.05 \text{ or } 77 \text{ days}$$

5. Payables (Creditors) Payment Period (C)

$$= \frac{\text{Average Payables for Materials}}{\text{Annual Credit Purchases}} \times 365$$

$$= \frac{\frac{₹ 68 + ₹ 71}{2}}{₹ 400} \times 365 = 63.41 \text{ or } 64 \text{ days}$$

(i) Net Operating Cycle Period

$$= R + W + F + D - C$$

$$= 53 + 35 + 45 + 77 - 64 = 146 \text{ days}$$

(ii) Number of Operating Cycle in the Year

$$= \frac{365}{\text{Operating Cycle Period}} = \frac{365}{146} = 2.5 \text{ times}$$

(iii) Amount of Working Capital Required

$$= \frac{\text{Annual Operating Cost}}{\text{Number of Operating Cycles}} = \frac{₹ 325}{2.48} = ₹ 130 \text{ lakh}$$

Question – 06

The following data relating to an auto component manufacturing company is available for the year 2020-21:

Raw material held in storage 20 days

Receivables' collection period 30 days

Conversion process period 10 days
(raw material – 100%, other costs – 50% complete)

Finished goods storage period 45 days

Credit period from suppliers 60 days

Advance payment to suppliers 5 days

Total cash operating expenses per annum ₹ 800 lakhs

75% of the total cash operating expenses are for raw material. 360 days are assumed in a year.

You are required to CALCULATE:

- Each item of current assets and current liabilities,
- The working capital requirement, if the company wants to maintain a cash balance of ₹ 10 lakhs at all times.

(Study Material ICAI TYK – 02)

Solution:

Since WIP is 100% complete in terms of material and 50% complete in terms of other cost, the same has been considered for number of days for WIP inventory i.e. 10 days for material and 5 days for other costs respectively.

Particulars	For Raw Material	For Other Costs	Total
Cash Operating expenses	$\frac{75}{100} \times 800 = 600$	$\frac{25}{100} \times 800 = 200$	800.00
Raw Material Stock Holding	$\frac{20}{360} \times 600 = 33.33$	-	33.33
WIP Conversion	$\frac{10}{360} \times 600 = 16.67$	$\frac{5}{360} \times 200 = 2.78$	19.45
Finished Goods Stock Holding	$\frac{45}{360} \times 600 = 75$	$\frac{45}{360} \times 200 = 25$	100.00
Receivable Collection Period	$\frac{30}{360} \times 600 = 50$	$\frac{30}{360} \times 200 = 16.67$	66.67
Advance to suppliers	$\frac{5}{360} \times 600 = 8.33$	-	8.33

Credit Period from suppliers	$\frac{60}{360} \times 600 = 100$	-	100.00
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Computation of Working Capital

	₹ in lakhs
Raw Materials Stock	33.33
WIP	19.45
Finished Goods Stock	100.00
Receivables	66.67
Advance to Suppliers	8.33
Cash	10.00
	237.78
Less: Payable (Creditors)	100.00
Working Capital	133.78

Question – 07

The following figures and ratios are related to a company:

(i) Sales for the year (all credit)	₹ 90,00,000
(ii) Gross Profit ratio	35 percent
(iii) Fixed assets turnover (based on cost of goods sold)	1.5
(iv) Stock turnover (based on cost of goods sold)	6
(v) Liquid ratio	1.5:1
(vi) Current ratio	2.5:1
(vii) Receivables (Debtors) collection period	1 month
(viii) Reserves and surplus to Share capital	1:1.5
(ix) Capital gearing ratio	0.7875
(x) Fixed assets to net worth	1.3 : 1

You are required to PREPARE:

- (a) Balance Sheet of the company on the basis of above details.

- (b) The statement showing working capital requirement, if the company wants to make a provision for contingencies @15 percent of net working capital.

(Study Material ICAI TYK – 03)

Solution:

Working Notes:

- (i) Cost of Goods Sold = Sales – Gross Profit (35% of Sales)
= ₹ 90,00,000 – ₹ 31,50,000
= ₹ 58,50,000
- (ii) Closing Stock = Cost of Goods Sold / Stock Turnover
= ₹ 58,50,000 / 6
= ₹ 9,75,000
- (iii) Fixed Assets = Cost of Goods Sold / Fixed Assets Turnover
= ₹ 58,50,000 / 1.5
= ₹ 39,00,000

- (iv) Current Assets and Current Liabilities

Current Ratio = 2.5 and Liquid Ratio = 1.5

CA / CL = 2.5 ... (i)

(CA – Inventories) / CL = 1.5 ... (ii)

By subtracting equation (ii) from (i), we get,

Inventories / CL = 1

Current Liabilities = Inventories (stock) = ₹ 9,75,000

∴ Current Assets = ₹ 9,75,000 × 2.5 = ₹ 24,37,500

Or

Current Ratio / Quick Ratio = Current Assets / Quick Assets

$2.5 / 1.5 = \text{Current Assets} / (\text{Current Assets} - \text{Inventory})$

$2.5/1.5 \text{ Current Assets} - 2.5/1.5 \times ₹ 9,75,000 = \text{Current Assets}$

Hence, Current Assets = ₹ 24,37,500

(v) Liquid Assets (Receivables and Cash)

= Current Assets – Inventories (Stock)

= ₹ 24,37,500 – ₹ 9,75,000

= ₹ 14,62,500

(vi) Receivables (Debtors) = Sales × Debtors Collection period / 12

= ₹ 90,00,000 × 1/12 = ₹ 7,50,000

(vii) Cash = Liquid Assets – Receivables (Debtors)

= ₹ 14,62,500 – ₹ 7,50,000

= ₹ 7,12,500

(viii) Net worth = Fixed Assets / 1.3

= ₹ 39,00,000 / 1.3 = ₹ 30,00,000

(ix) Reserves and Surplus

Reserves and Surplus / Share Capital = 1/1.5

Share Capital = 1.5 Reserves and Surplus ... (i)

Now, Reserves and Surplus + Share Capital = Net worth ... (ii)

From (i) and (ii), we get,

2.5 Reserves and Surplus = Net worth

Reserves and Surplus = ₹ 30,00,000 / 2.5 = ₹ 12,00,000

(x) Share Capital = Net worth – Reserves and Surplus

$$= ₹ 30,00,000 - ₹ 12,00,000$$

$$= ₹ 18,00,000$$

(xi) Long-term Debts

Capital Gearing Ratio = Long-term Debts / Equity Shareholders' Fund

$$\text{Long-term Debts} = ₹ 30,00,000 \times 0.7875 = ₹ 23,62,500$$

(a) Balance Sheet of the Company

Particulars	Figures as the end of 31-03-2021 (₹)	Figures as the end of 31-03-2020 (₹)
I. EQUITY AND LIABILITIES		-
Shareholders' funds		-
(a) Share capital	18,00,000	-
(b) Reserves and surplus	12,00,000	-
Non-current liabilities		-
(a) Long-term borrowings	23,62,500	-
Current liabilities	9,75,000	-
TOTAL	63,37,500	-
II. ASSETS		-
Non-current assets		-
Fixed assets	39,00,000	-
Current assets		-
Inventories	9,75,000	-
Trade receivables	7,50,000	-
Cash and cash equivalents	7,12,500	-
TOTAL	63,37,500	-

(b) Statement Showing Working Capital Requirement

	(₹)	(₹)
A. Current Assets		
(i) Inventories (Stocks)		9,75,000
(ii) Receivables (Debtors)		7,50,000
(iii) Cash in hand & at bank		7,12,500
Total Current Assets		24,37,500
B. Current Liabilities:		
Total Current Liabilities		9,75,000

Net Working Capital (A – B)		14,62,500
Add: Provision for contingencies (15% of Net Working Capital)		2,19,375
Working capital requirement		16,81,875

Question – 08

PQ Ltd., a company newly commencing business in 2020-21 has the following projected Profit and Loss Account:

	(₹)	(₹)
Sales		2,10,000
Cost of goods sold		<u>1,53,000</u>
Gross Profit		57,000
Administrative Expenses	14,000	
Selling Expenses	<u>13,000</u>	<u>27,000</u>
Profit before tax		30,000
Provision for taxation		<u>10,000</u>
Profit after tax		<u>20,000</u>
The cost of goods sold has been arrived at as under:		
Materials used	84,000	
Wages and manufacturing Expenses	62,500	
Depreciation	<u>23,500</u>	
	1,70,000	
Less: Stock of Finished goods (10% of goods produced not yet sold)	<u>17,000</u>	
	<u>1,53,000</u>	

The figure given above relate only to finished goods and not to work-in-progress. Goods equal to 15% of the year's production (in terms of physical units) will be in process on the average requiring full materials but only 40% of the other expenses. The company believes in keeping materials equal to two months' consumption in stock.

All expenses will be paid one month in advance. Suppliers of materials will extend 1-1/2 months credit. Sales will be 20% for cash and the rest at two months' credit. 70% of the Income tax will be paid in advance in quarterly installments. The company wishes to keep ₹ 8,000 in cash. 10% has to be added to the estimated figure for unforeseen contingencies.

PREPARE an estimate of working capital.

Note: All workings should form part of the answer.

Solution:**Statement showing the requirements of Working Capital**

Particulars	(₹)	(₹)
A. Current Assets:		
Inventory:		
Stock of Raw material ($₹ 96,600 \times 2/12$)	16,100	
Stock of Work-in-progress (As per Working Note)	16,350	
Stock of Finished goods ($₹ 1,46,500 \times 10/100$)	14,650	
Receivables (Debtors) ($₹ 1,27,080 \times 2/12$)	21,180	
Cash in Hand	8,000	
Prepaid Expenses:		
Wages & Mfg. Expenses ($₹ 66,250 \times 1/12$)	5,521	
Administrative expenses ($₹ 14,000 \times 1/12$)	1,167	
Selling & Distribution Expenses ($₹ 13,000 \times 1/12$)	1,083	
Advance taxes paid $\{(70\% \text{ of } ₹ 10,000) \times 3/12\}$	1,750	
Gross Working Capital	85,801	85,801
B. Current Liabilities:		
Payables for Raw materials ($₹ 1,12,700 \times 1.5/12$)	14,088	
Provision for Taxation (Net of Advance Tax) ($₹ 10,000 \times 30/100$)	3,000	
Total Current Liabilities	17,088	17,088
C. Excess of CA over CL		68,713
Add: 10% for unforeseen contingencies		6,871
Net Working Capital requirements		75,584

Working Notes:**(i) Calculation of Stock of Work-in-progress**

Particulars	(₹)
Raw Material ($₹ 84,000 \times 15\%$)	12,600
Wages & Mfg. Expenses ($₹ 62,500 \times 15\% \times 40\%$)	3,750
Total	16,350

(ii) Calculation of Stock of Finished Goods and Cost of Sales

Particulars	(₹)
Direct material Cost [$₹ 84,000 + ₹ 12,600$]	96,600

Wages & Mfg. Expenses [₹ 62,500 + ₹ 3,750]	66,250
Depreciation	0
Gross Factory Cost	1,62,850
Less: Closing W.I.P	(16,350)
Cost of goods produced	1,46,500
Add: Administrative Expenses	14,000
	1,60,500
Less: Closing stock	(14,650)
Cost of Goods Sold	1,45,850
Add: Selling and Distribution Expenses	13,000
Total Cash Cost of Sales	1,58,850
Debtors (80% of cash cost of sales)	1,27,080

(iii) Calculation of Credit Purchase

Particulars	(₹)
Raw Materials Consumed	96,600
Add: Closing Stock	16,100
Less: Opening Stock	-
Purchase	1,12,700

Question – 09

M.A. Limited is commencing a new project for manufacture of a plastic component. The following cost information has been ascertained for annual production of 12,000 units which is the full capacity:

	Costs per unit (₹)
Materials	40.00
Direct labour and variable expenses	20.00
Fixed manufacturing expenses	6.00
Depreciation	10.00
Fixed administration expenses	4.00
	80.00

The selling price per unit is expected to be ₹ 96 and the selling expenses ₹ 5 per unit, 80% of which is variable.

In the first two years of operations, production and sales are expected to be as follows:

Year	Production (No. of units)	Sales (No. of units)
1	6,000	5,000
2	9,000	8,500

To assess the working capital requirements, the following additional information is available:

(a)	Stock of materials	2.25 month's average consumption
(b)	Work-in-process	Nil
(c)	Debtors	1 month's average sales.
(d)	Cash balance	₹ 10,000
(e)	Creditors for supply of materials	1 month's average purchase during the year.
(f)	Creditors for expenses	1 month's average of all expense during the year.

PREPARE, for the two years:

- A projected statement of Profit/Loss (Ignoring taxation); and
- A projected statement of working capital requirements.

(Study Material ICAI TYK – 05)

Solution:

(i) M.A. Limited Projected Statement of Profit / Loss (Ignoring Taxation)

	Year 1	Year 2
Production (Units)	6,000	9,000
Sales (Units)	5,000	8,500
	(₹)	(₹)
Sales revenue (A) (Sales unit × ₹ 96)	4,80,000	8,16,000
Cost of production:		
Materials cost (Units produced × ₹ 40)	2,40,000	3,60,000
Direct labour and variable expenses (Units produced × ₹ 20)	1,20,000	1,80,000
Fixed manufacturing expenses (Production Capacity: 12,000 units × ₹ 6)	72,000	72,000
Depreciation (Production Capacity : 12,000 units × ₹ 10)	1,20,000	1,20,000
Fixed administration expenses (Production Capacity : 12,000 units × ₹ 4)	48,000	48,000

Total Costs of Production	6,00,000	7,80,000
Add: Opening stock of finished goods (Year 1 : Nil; Year 2 : 1,000 units)	---	1,00,000
Cost of Goods available for sale (Year 1: 6,000 units; Year 2: 10,000 units)	6,00,000	8,80,000
Less: Closing stock of finished goods at average cost (year 1: 1000 units, year 2 : 1500 units) (Cost of Production × Closing stock/ units produced)	(1,00,000)	(1,32,000)
Cost of Goods Sold	5,00,000	7,48,000
Add: Selling expenses – Variable (Sales unit × ₹ 4)	20,000	34,000
Add: Selling expenses – Fixed (12,000 units × ₹ 1)	12,000	12,000
Cost of Sales : (B)	5,32,000	7,94,000
Profit (+) / Loss (-): (A – B)	(-) 52,000	(+) 22,000

Working Notes:**1. Calculation of creditors for supply of materials:**

	Year 1 (₹)	Year 2 (₹)
Materials consumed during the year	2,40,000	3,60,000
Add: Closing stock (2.25 month's average consumption)	45,000	67,500
	2,85,000	4,27,500
Less: Opening Stock	---	45,000
Purchases during the year	2,85,000	3,82,500
Average purchases per month (Creditors)	23,750	31,875

2. Creditors for expenses:

	Year 1 (₹)	Year 2 (₹)
Direct labour and variable expenses	1,20,000	1,80,000
Fixed manufacturing expenses	72,000	72,000
Fixed administration expenses	48,000	48,000
Selling expenses (variable + fixed)	32,000	46,000
Total (including)	2,72,000	3,46,000
Average per month	22,667	28,833

(ii) Projected Statement of Working Capital requirements

	Year 1 (₹)	Year 2 (₹)
Current Assets:		

Inventories:		
- Stock of materials (2.25 month's average consumption)	45,000	67,500
- Finished goods	1,00,000	1,32,000
Debtors (1 month's average sales) (including profit)	40,000	68,000
Cash	10,000	10,000
Total Current Assets/ Gross working capital (A)	1,95,000	2,77,500
Current Liabilities:		
Creditors for supply of materials (Refer to working note 1)	23,750	31,875
Creditors for expenses (Refer to working note 2)	22,667	28,833
Total Current Liabilities: (B)	46,417	60,708
Estimated Working Capital Requirements: (A-B)	1,48,583	2,16,792

Projected Statement of Working Capital Requirement (Cash Cost Basis)

	Year 1 (₹)	Year 2 (₹)
(A) Current Assets		
Inventories:		
- Stock of Raw Material (6,000 units × ₹ 40 × 2.25/12); (9,000 units × ₹ 40 × 2.25 /12)	45,000	67,500
- Finished Goods (Refer working note 3)	80,000	1,11,000
Receivables (Debtors) (Refer working note 4)	36,000	56,250
Minimum Cash balance	10,000	10,000
Total Current Assets/ Gross working capital (A)	1,71,000	2,44,750
(B) Current Liabilities		
Creditors for raw material (Refer working note 1)	23,750	31,875
Creditors for Expenses (Refer working note 2)	22,667	28,833
Total Current Liabilities	46,417	60,708
Net Working Capital (A – B)	1,24,583	1,84,042

Working Note:

3. Cash Cost of Production:

	Year 1 (₹)	Year 2 (₹)
Cost of Production as per projected Statement of P&L	6,00,000	7,80,000
Less: Depreciation	1,20,000	1,20,000
Cash Cost of Production	4,80,000	6,60,000
Add: Opening Stock at Average Cost:	---	80,000

Cash Cost of Goods Available for sale	4,80,000	7,40,000
Less : Closing Stock at Avg. Cost $\left(\frac{₹ 4,80,000 \times 1,000}{6,000} \right) ; \left(\frac{₹ 7,40,000 \times 1,500}{10,000} \right)$	(80,000)	(1,11,000)
Cash Cost of Goods Sold	4,00,000	6,29,000

4. Receivables (Debtors)

	Year 1 (₹)	Year 2 (₹)
Cash Cost of Goods Sold	4,00,000	6,29,000
Add : Variable Expenses @ ₹ 4	20,000	34,000
Add : Total Fixed Selling expenses (12,000 units × ₹1)	12,000	12,000
Cash Cost of Debtors	4,32,000	6,75,000
Average Debtors	36,000	56,250

Question – 10

Aneja Limited, a newly formed company, has applied to a commercial bank for the first time for financing its working capital requirements. The following information is available about the projections for the current year:

Estimated level of activity: 1,04,000 completed units of production plus 4,000 units of work-in-progress. Based on the above activity, estimated cost per unit is:

Raw material	₹ 80 per unit
Direct wages	₹ 30 per unit
Overheads (exclusive of depreciation)	<u>₹ 60 per unit</u>
Total cost	<u>₹ 170 per unit</u>
Selling price	<u>₹ 200 per unit</u>

Raw materials in stock: Average 4 weeks consumption, work-in-progress (assume 50% completion stage in respect of conversion cost) (materials issued at the start of the processing).

Finished goods in stock	8,000 units
Credit allowed by suppliers	Average 4 weeks

Credit allowed to debtors/receivables

Average 8 weeks

Lag in payment of wages

Average 1.5 weeks

Cash at banks (for smooth operation) is expected to be ₹ 25,000.

Assume that production is carried on evenly throughout the year (52 weeks) and wages and overheads accrue similarly. All sales are on credit basis only.

You are required to CALCULATE the net working capital required.

(Study Material ICAI TYK – 06)**Solution:****Calculation of Net Working Capital requirement:**

	(₹)	(₹)
A. Current Assets:		
Inventories:		
- Raw material stock (Refer to Working note 3)	6,64,615	
- Work in progress stock (Refer to Working note 2)	5,00,000	
Finished goods stock (Refer to Working note 4)	13,60,000	
Receivables (Debtors) (Refer to Working note 5)	25,10,769	
Cash and Bank balance	25,000	
Gross Working Capital	50,60,384	50,60,384
B. Current Liabilities:		
Creditors for raw materials (Refer to Working note 6)	7,15,740	
Creditors for wages (Refer to Working note 7)	91,731	
	8,07,471	8,07,471
Net Working Capital (A - B)		42,52,913

Working Notes:**1. Annual cost of production**

	(₹)
Raw material requirements {(1,04,000 units × ₹ 80) + ₹ 3,20,000}	86,40,000
Direct wages {(1,04,000 units × ₹ 30) + ₹ 60,000}	31,80,000
Overheads (exclusive of depreciation) {(1,04,000 × ₹ 60) + ₹ 1,20,000}	63,60,000
Gross Factory Cost	1,81,80,000

Less: Closing W.I.P	(5,00,000)
Cost of Goods Produced	1,76,80,000
Less: Closing Stock of Finished Goods (₹ 1,76,80,000 × 8,000/1,04,000)	(13,60,000)
Total Cash Cost of Sales	1,63,20,000

2. Work in progress stock

	(₹)
Raw material requirements (4,000 units × ₹ 80)	3,20,000
Direct wages (50% × 4,000 units × ₹ 30)	60,000
Overheads (50% × 4,000 units × ₹ 60)	1,20,000
	5,00,000

3. Raw material stock

It is given that raw material in stock is average 4 weeks consumption. Since, the company is newly formed, the raw material requirement for production and work in progress will be issued and consumed during the year.

Hence, the raw material consumption for the year (52 weeks) is as follows:

	(₹)
For Finished goods (1,04,000 × ₹ 80)	83,20,000
For Work in progress (4,000 × ₹ 80)	3,20,000
	86,40,000

Raw material stock $\frac{₹ 86,40,000}{52 \text{ weeks}} \times 4 \text{ weeks}$ i.e. ₹ 6,64,615

4. Finished goods stock: 8,000 units @ ₹ 170 per unit = ₹ 13,60,000

5. Debtors for sale: $1,63,20,000 \times \frac{8}{52} = ₹ 25,10,769$

6. Creditors for raw material:

Material Consumed (₹ 83,20,000 + ₹ 3,20,000) ₹ 86,40,000

Add: Closing stock of raw material ₹ 6,64,615

Purchases of Raw Material ₹ 93,04,615

$$\text{Credit allowed by suppliers} = \frac{\text{₹ } 93,04,615}{52 \text{ weeks}} \times 4 \text{ weeks} = \text{₹ } 7,15,740$$

7. Creditors for wages:

$$\text{Outstanding wage payment} = \frac{\text{₹ } 31,80,000}{52 \text{ weeks}} \times 1.5 \text{ weeks} = \text{₹ } 91,731$$

Question – 11

The management of Trux Company Ltd. is planning to expand its business and consults you to prepare an estimated working capital statement. The records of the company reveals the following annual information:

	(₹)
Sales – Domestic at one month's credit	18,00,000
Export at three month's credit (sales price 10% below domestic price)	8,10,000
Materials used (suppliers extend two months credit)	6,75,000
Lag in payment of wages – ½ month	5,40,000
Lag in payment of manufacturing expenses (cash) – 1 month	7,65,000
Lag in payment of Administration Expenses – 1 month	1,80,000
Selling expenses payable quarterly in advance	1,12,500
Income tax payable in four installments, of which one falls in the next financial year	1,68,000

Rate of gross profit is 20%. Ignore work-in-progress and depreciation.

The company keeps one month's stock of raw materials and finished goods (each) and believes in keeping ₹ 2,50,000 available to it including the overdraft limit of ₹ 75,000 not yet utilized by the company.

The management is also of the opinion to make 10% margin for contingencies on computed figure.

You are required to PREPARE the estimated working capital statement for the next year.

(Study Material ICAI TYK – 07)

Solution:**Preparation of Statement of Working Capital Requirement for Trux Company Ltd.**

	(₹)	(₹)
A. Current Assets		
(i) Inventories:		
Material (1 month) $\left(\frac{₹ 6,75,000}{12 \text{ months}} \times 1 \text{ month} \right)$	56,250	
Finished Goods (1 month) $\left(\frac{₹ 21,60,000}{12 \text{ months}} \times 1 \text{ month} \right)$	1,80,000	2,36,250
(ii) Receivables (Debtors)		
For Domestic Sales $\left(\frac{₹ 15,17,586}{12 \text{ months}} \times 1 \text{ month} \right)$	1,26,466	
For Export Sales $\left(\frac{₹ 7,54,914}{12 \text{ months}} \times 3 \text{ months} \right)$	1,88,729	3,15,195
(iii) Prepayment of Selling Expenses $\left(\frac{₹ 1,12,500}{12 \text{ months}} \times 3 \text{ months} \right)$		28,125
(iv) Cash in hand & at bank (net of overdraft)		1,75,000
Total Current Assets		7,54,570
B. Current Liabilities:		
(i) Payables (Creditors) for materials (2 months) $\left(\frac{₹ 6,75,500}{12 \text{ months}} \times 2 \text{ months} \right)$		1,12,500
(ii) Outstanding wages (0.5 months) $\left(\frac{₹ 5,40,000}{12 \text{ months}} \times 0.5 \text{ month} \right)$		22,500
(iii) Outstanding manufacturing expenses $\left(\frac{₹ 7,65,000}{12 \text{ months}} \times 1 \text{ month} \right)$		63,750
(iv) Outstanding Administrative Expenses $\left(\frac{₹ 1,80,000}{12 \text{ months}} \times 0.5 \text{ months} \right)$		15,000
(v) Income Tax Payable		42,000
Total Current Liabilities		2,55,750
Net Working Capital (A – B)		4,98,820
Add: 10% Contingency margin		49,882
Total Working Capital Required		5,48,702

Working Notes:**1. Calculation of Cost of Goods Sold and Cost of Sales**

	Domestic (₹)	Export (₹)	Total (₹)
Domestic Sales	18,00,000	8,10,000	26,10,000
Less: Gross profit @ 20% on domestic sales and 11.11% on export sales (Working note-2)	3,60,000	90,000	4,50,000
Cost of Goods Sold	14,40,000	7,20,000	21,60,000
Add: Selling expenses (Working note-3)	77,586	34,914	1,12,500
Cash Cost of Sales	15,17,586	7,54,914	22,72,500

2. Calculation of gross profit on Export Sales

Let domestic selling price is ₹ 100. Gross profit is ₹ 20, and then cost per unit is ₹ 80

Export price is 10% less than the domestic price i.e. ₹ 100-(1-0.1)= ₹ 90

Now, gross profit will be = ₹ 90 - ₹ 80 = ₹ 10

So, Gross profit ratio at export price will be = $\frac{₹ 10}{₹ 90} \times 100 = 11.11\%$

3. Apportionment of Selling expenses between Domestic and Exports sales:

Apportionment on the basis of sales value:

$$\text{Domestic Sales} = \frac{₹ 1,12,500}{₹ 26,10,000} \times ₹ 18,00,000 = ₹ 77,586$$

$$\text{Export Sales} = \frac{₹ 1,12,500}{₹ 26,10,000} \times ₹ 8,10,000 = ₹ 34,914$$

4. Assumptions

- (i) It is assumed that administrative expenses is related to production activities.
- (ii) Value of opening and closing stocks are equal.

Question – 12

PREPARE a working capital estimate to finance an activity level of 52,000 units a year (52 weeks) based on the following data:

Raw Materials	- ₹ 400 per unit
Direct Wages	- ₹ 150 per unit
Overheads (Manufacturing)	- ₹ 200 per unit
Overheads (Selling & Distribution)	- ₹ 100 per unit

Selling Price - ₹ 1,000 per unit, Raw materials & Finished Goods remain in stock for 4 weeks, Work in process takes 4 weeks. Debtors are allowed 8 weeks for payment whereas creditors allow us 4 weeks.

Minimum cash balance expected is ₹ 50,000. Receivables are valued at Selling Price.

(Study Material ICAI TYK – 14)

Solution:

Cost Structure for 52,000 units	
Particulars	Amount (₹)
Raw Material @ ₹ 400P	2,08,00,000
Direct Wages @ ₹ 150	78,00,000
Manufacturing Overheads @ ₹ 200	1,04,00,000
Selling and Distribution OH @ ₹ 100	52,00,000
Total Cost	4,42,00,000
Sales @ ₹ 1,000	5,20,00,000

Particulars	Calculation	Amount (₹)
A. Current Assets:		
Raw Materials Stock	$2,08,00,000 \times \frac{4}{52}$	16,00,000
Work in Progress (WIP Stock)**	$2,08,00,000 + \frac{(78,00,000 + 1,04,00,000)}{2} \times \frac{4}{52}$	23,00,000
Finished Goods Stock	$4,42,00,000 \times \frac{4}{52}$	34,00,000
Receivables	$5,20,00,000 \times \frac{8}{52}$	80,00,000

Cash		<u>50,000</u>
	Total Current Assets	1,53,50,000
B. Current Liabilities:		
Creditors	$2,08,00,000 \times \frac{4}{52}$	<u>16,00,000</u>
C. Working Capital Estimates (A-B)		1,37,50,000

** Assuming that labour and overhead are incurred evenly throughout the year.

Question – 13

On 01st April, 2020, the Board of Director of ABC Ltd. wish to know the amount of working capital that will be required to meet the programme they have planned for the year. From the following information, PREPARE a working capital requirement forecast and a forecast profit and loss account and balance sheet:

Issued share capital ₹ 6,00,000

10% Debentures ₹ 1,00,000

Fixed Assets ₹ 4,50,000

Production during the previous year was 1,20,000 units; it is planned that this level of activity should be maintained during the present year.

The expected ratios of cost to selling price are: raw materials 60%, direct wages 10% overheads 20%

Raw materials are expected to remain in store for an average of two months before issue to production. Each unit of production is expected to be in process for one month. The time lag in wage payment is one month.

Finished goods will stay in the warehouse awaiting dispatch to customers for approximately three months.

Credit allowed by creditors is two months from the date of delivery of raw materials. Credit given to debtors is three months from the date of dispatch.

Selling price is ₹ 5 per unit.

There is a regular production and sales cycle and wages and overheads accrue evenly.

(MTP Nov – 2021)

Solution:**Forecast Profit and Loss Account for the period 01.04.2020 to 31.03.2021**

Particulars	₹	Particulars	₹
Materials consumed 1,20,000 @ ₹ 3	3,60,000	By Sales 1,20,000 @ ₹ 5	6,00,000
Direct wages : 1,20,000 @ ₹ 0.5	60,000		
Overheads : 1,20,000 @ ₹ 1	1,20,000		
Gross profit c/d	60,000		
	6,00,000		6,00,000
Debenture interest (10% of 1,00,000)	10,000	By gross profit b/d	60,000
Net profit c/d	50,000		
	6,00,000		6,00,000

Working Capital Requirement Forecast for the year 01.04.2020 to 31.03.2021

Particulars	Period (Months)	Total (₹)	Current Assets (₹)				Current Liabilities (₹)
			Raw materials	Work-in-progress	Finished goods	Debtors	Creditors
1. Material							
In store	2		60,000				
In work-in-progress	1			30,000			
In finished goods	3				90,000		
Credit to debtors	<u>3</u>					90,000	
	9						
Less : Credit from creditors	<u>2</u>						60,000
Net block period	<u>7</u>	2,10,000					
2. Wages:							
In work-in-progress	½			2,500			
In finished goods	3				15,000		
Credit to debtors	<u>3</u>					15,000	

	6½						
Less : Time lag in payment	<u>1</u>						5,000
Net block period	<u>5½</u>	27,500					
3. Overheads:							
In work-in-progress				5,000			
In finished goods	3				30,000		
Credit to debtors	<u>3</u>					30,000	
Net block period	<u>6½</u>	65,000					
4. Profit							
Credit to debtors	<u>3</u>					15,000	
Net block period	<u>3</u>	15,000					
Total (₹)		3,17,500	60,000	37,500	1,35,000	1,50,000	65,000

Forecast Balance Sheet as on 31.03.2021

	(₹)			(₹)
Issued share capital	6,00,000	Fixed Assets		4,50,000
Profit and Loss A/c	50,000	Current Assets:		
10% Debentures	1,00,000	Stock:		
Sundry creditors	65,000	Raw materials	60,000	
Bank overdraft -		Work-in-progress	37,500	
Balancing figure	17,500	Finished goods	1,35,000	2,32,500
		Debtors		1,50,000
	8,32,500			8,32,500

The Total amount of working capital, thus, stands as follows:	₹
Requirement as per working capital	3,17,500
Less: Bank overdraft as per balance sheet	<u>17,500</u>
Net requirement	<u>3,00,000</u>

- Average monthly production: $1,20,000 \div 12 = 10,000$ units
- Average cost per month:

Raw Material	$10,000 \times (\text{₹ } 5 \times 0.6) = \text{₹ } 30,000$
Direct wages	$10,000 \times (\text{₹ } 5 \times 0.1) = \text{₹ } 5,000$
Overheads	$10,000 \times (\text{₹ } 5 \times 0.2) = \text{₹ } 10,000$
- Average profit per month: $10,000 \times (\text{₹ } 5 \times 0.1) = \text{₹ } 5,000$
- Wages and overheads accrue evenly over the period and, hence, are assumed to be completely introduced for half the processing time.

Question – 14

The below information for Lever Ltd is provided on annual basis:

	₹
Sales at 3 months credit	48,00,000
Materials consumed (suppliers extend 2 months credit)	12,00,000
Wages paid (one month lag in payment)	9,60,000
Cash manufacturing expenses (paid on month in arrear)	12,00,000
Administrative expense (one month lag in payment)	3,60,000
Sales promotion expense (paid monthly in advance)	1,20,000

The Company sells its products at a gross profit of 20%.

The Company keeps two months stock of raw materials and two months stock of finished goods.

Depreciation is considered as a part of cost of production.

Cash balance is retained at ₹ 1,00,000,

Assuming a 15% margin, COMPUTE the working capital requirements of the Company on cash cost basis. Ignore work-in progress.

(MTP April – 2024)

Solution:**(i) Working Notes:**

(i) Computation of Annual Cash cost of production	(₹)
Material consumed	12,00,000
Wages	9,60,000
Manufacturing expenses	12,00,000
Total cash cost of production	33,60,000
(ii) Computation of Annual Cash Cost of Sales:	(₹)
Total Cash cost of production as in (i) above	33,60,000
Administrative Expenses	3,60,000
Sales promotion expenses	1,20,000
Total cash cost of sales	38,40,000
Add: Gross Profit @ 20% on sales (25% on cost of sales)	9,60,000
Sales Value	48,00,000

Statement of Working Capital requirements (cash cost basis)

		(₹)	(₹)
A.	Current Assets		
(i)	Inventories:		
	- Raw material $\left(\frac{12,00,000}{12 \text{ months}} \times 2 \text{ months} \right)$	2,00,000	
	Finished goods $\left(\frac{₹ 33,60,000}{12 \text{ months}} \times 2 \text{ months} \right)$	5,60,000	
	Receivables (Debtors) $\left(\frac{₹ 38,40,000}{12 \text{ months}} \times 3 \text{ months} \right)$	9,60,000	
	Sales Promotion expenses paid in advance $\left(\frac{₹ 1,20,000}{12 \text{ months}} \times 1 \text{ months} \right)$	10,000	
	Cash Balance	1,00,000	18,30,000
	Gross Working Capital		18,30,000
B.	Current Liabilities:		
	Payables:		
	- Creditors for materials $\left(\frac{₹ 12,00,000}{12 \text{ months}} \times 2 \text{ months} \right)$	2,00,000	
	Wages Outstanding $\left(\frac{₹ 9,60,000}{12 \text{ months}} \times 1 \text{ months} \right)$	80,000	
	Manufacturing expenses outstanding $\left(\frac{₹ 12,00,000}{12 \text{ months}} \times 1 \text{ months} \right)$	1,00,000	
	Administrative expenses outstanding $\left(\frac{₹ 3,60,000}{12 \text{ months}} \times 1 \text{ months} \right)$	30,000	4,10,000
	Net working capital (A - B)		14,20,000
	Add: Safety margin @ 15%		2,13,000
	Total Working Capital requirements		16,33,000

Question – 15

PREPARE a working capital estimate to finance an activity level of 52,000 units a year (52 weeks) based on the following data:

Raw Materials - ₹ 400 per unit

Direct Wages - ₹150 per unit

Overheads (Manufacturing) - ₹ 200 per unit

Overheads (Selling & Distribution) - ₹ 100 per unit

Selling Price - ₹ 1,000 per unit, Raw materials & Finished Goods remain in stock for 4 weeks, Work in process takes 4 weeks. Debtors are allowed 8 weeks for payment whereas creditors allow us 4 weeks.

Minimum cash balance expected is ₹ 50,000. Receivables are valued at Selling Price.

(MTP October – 2022)

Solution:

Cost Structure for 52000 units	
Particular	Amount (₹)
Raw Material @ ₹ 400	2,08,00,000
Direct Wages @ ₹ 150	78,00,000
Manufacturing overheads ₹ @ 200	1,04,00,000
Selling and Distribution OH ₹ @ 100	52,00,000
Total Cost	4,42,00,000
Sales @ ₹ 1000	5,20,00,000

Particulars	Calculation	Amount (₹)
A. Current Assets:		
Raw Material Stock	$2,08,00,000 \times \frac{4}{52}$	16,00,000
Work in Progress (WIP) Stock	$\frac{2,08,00,000 + (78,00,000 + 1,04,00,000)}{2} \times \frac{4}{52}$	23,00,000
Finished Goods Stock	$4,42,00,000 \times \frac{4}{52}$	34,00,000
Receivables	$5,20,00,000 \times \frac{8}{52}$	80,00,000
Cash		<u>50,000</u>
	Total Current Assets	1,53,50,000
B. Current Liabilities:		
Creditors	$2,08,00,000 \times \frac{4}{52}$	16,00,000
C. Working Capital Estimates (A-B)		1,37,50,000

Question – 16

Following information is forecasted by the Puja Limited for the year ending 31st March, 20X8:

	Balance as at 1 st April 2017 (₹)	Balance as at 31 st March 2018 (₹)
Raw Material	45,000	65,356
Work-in-progress	35,000	51,300
Finished goods	60,181	70,175
Debtors	1,12,123	1,35,000
Creditors	50,079	70,469
Annual purchases of raw material (all credit)		4,00,000
Annual cost of production		7,50,000
Annual cost of goods sold		9,15,000
Annual operating cost		9,50,000
Annual sales (all credit)		11,00,000

You may take one year as equal to 365 days.

Required:

CALCULATE

- Net operating cycle period.
- Number of operating cycles in the year.
- Amount of working capital requirement using operating cycles.

(RTP May – 2018)

Solution:**Working Notes:****1. Raw Material Storage Period (R)**

$$\begin{aligned}
 &= \frac{\text{Average Stock of Raw Material}}{\text{Annual Consumption of Raw Material}} \times 365 \\
 &= \frac{\frac{₹ 45,000 + 65,356}{2}}{₹ 3,79,644} \times 365
 \end{aligned}$$

= 53 days.

Annual Consumption of Raw Material

= Opening Stock + Purchases – Closing Stock

= ₹ 45,000 + ₹ 4,00,000 – ₹ 65,356

= ₹ 3,79,644

2. Work-in-Progress (WIP) Conversion Period (W)

$$\begin{aligned}\text{WIP Conversion Period} &= \frac{\text{Average Stock of WIP}}{\text{Annual Cost of Production}} \times 365 \\ &= \frac{\frac{₹ 35,000 + 51,300}{2}}{₹ 7,50,000} \times 365 \\ &= 21 \text{ days.}\end{aligned}$$

3. Finished Stock Storage Period (F)

$$\begin{aligned}&= \frac{\text{Average Stock of Finished Goods}}{\text{Cost of Goods Sold}} \times 365 \\ &= \frac{₹ 65,178}{₹ 9,15,000} \times 365 = 26 \text{ days.}\end{aligned}$$

$$\text{Average Stock} = \frac{₹ 60,181 + ₹ 70,175}{2} = ₹ 65,178.$$

4. Debtors Collection Period (D)

$$\begin{aligned}&= \frac{\text{Average Debtors}}{\text{Annual Credit Sales}} \times 365 \\ &= \frac{₹ 1,23,561.50}{₹ 11,00,000} \times 365 = 41 \text{ days.}\end{aligned}$$

$$\text{Average debtors} = \frac{₹ 1,12,123 + ₹ 1,35,000}{2} = ₹ 1,23,561.50$$

5. Creditors Payment Period (C)

$$= \frac{\text{Average Creditors}}{\text{Annual Net Credit Purchases}} \times 365$$

$$= \frac{\left(\frac{₹ 50,079 + ₹ 70,469}{2} \right)}{₹ 4,00,000} \times 365$$

= 55 days.

(i) Operating Cycle Period

$$= R + W + F + D - C$$

$$= 53 + 21 + 26 + 41 - 55$$

$$= 86 \text{ days}$$

(ii) Number of Operating Cycles in the Year

$$= \frac{365}{\text{Operating Cycle Period}} = \frac{365}{86} = 4.244$$

(iii) Amount of Working Capital Required

$$= \frac{\text{Annual Operating Cost}}{\text{Number of Operating Cycles}} = \frac{₹ 9,50,000}{4.244} = ₹ 2,23,845.42$$

Question – 17

A proforma cost sheet of a company provides the following particulars:

	Amount per unit (₹)
Raw materials cost	100.00
Direct labour cost	37.50
Overheads cost	75.00
Total cost	212.50
Profit	37.50
Selling Price	250.00

The Company keeps raw material in stock, on an average for one month; work-in-progress, on an average for one week; and finished goods in stock, on an average for two weeks.

The credit allowed by suppliers is three weeks and company allows four weeks credit to its debtors. The lag in payment of wages is one week and lag in payment of overhead expenses is two weeks.

The Company sells one-fifth of the output against cash and maintains cash-in-hand and at bank put together at ₹ 37,500.

Required:

PREPARE a statement showing estimate of Working Capital needed to finance an activity level of 1,30,000 units of production. Assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. Work-in-progress stock is 80% complete in all respects.

(RTP May – 2019)

Solution:

	(Amount in ₹)	(Amount in ₹)
A. Current Assets		
(i) Inventories:		
Raw material (1 month or 4 weeks) $\left(\frac{1,30,000 \text{ units} \times ₹ 100}{₹ 52 \text{ weeks}} \times 4 \text{ weeks} \right)$	10,00,000	
WIP Inventory (1 week) $\left(\frac{1,30,000 \text{ units} \times ₹ 212.50}{₹ 52 \text{ weeks}} \times 1 \text{ weeks} \right) \times 0.8$	4,25,000	
Finished goods inventory (2 weeks) $\left(\frac{1,30,000 \text{ units} \times ₹ 212.50}{₹ 52 \text{ weeks}} \times 2 \text{ weeks} \right)$	10,62,500	24,87,500
(ii) Receivables (Debtors) (4 weeks) $\left(\frac{1,30,000 \text{ units} \times ₹ 212.50}{₹ 52 \text{ weeks}} \times 4 \text{ weeks} \right) \times \frac{4}{5\text{th}}$		17,00,000
(iii) Cash and bank balance		37,500
Total Current Assets		42,25,000
B. Current Liabilities:		
(i) Payables (Creditors) for materials (3 weeks) $\left(\frac{1,30,000 \text{ units} \times ₹ 100}{₹ 52 \text{ weeks}} \times 3 \text{ weeks} \right)$		7,50,000
(ii) Outstanding wages (1 week) $\left(\frac{1,30,000 \text{ units} \times ₹ 37.50}{₹ 52 \text{ weeks}} \times 1 \text{ weeks} \right)$		93,750
(iii) Outstanding overheads (2 weeks) $\left(\frac{1,30,000 \text{ units} \times ₹ 75}{₹ 52 \text{ weeks}} \times 1 \text{ weeks} \right)$		3,75,000
Total Current Liabilities		12,18,750
Net Working Capital Needs (A – B)		30,06,250

Question – 18

Day Ltd., a newly formed company has applied to the Private Bank for the first time for financing its Working Capital Requirements. The following information is available about the projections for the current year:

Estimated Level of Activity	Completed Units of Production 31,200 plus unit of work in progress 12,000
Raw Material Cost	₹ 40 per unit
Direct Wages Cost	₹ 15 per unit
Overhead	₹ 40 per unit (inclusive of Depreciation ₹ 10 per unit)
Selling Price	₹ 130 per unit
Raw Material in Stock	Average 30 days consumption
Work in Progress Stock	Material 100% and Conversion Cost 50%
Finished Goods Stock	24,000 Units
Credit Allowed by the supplier	30 days
Credit Allowed to Purchasers	60 days
Direct Wages (Lag in payment)	15 days
Expected Cash Balance	₹ 2,00,000

Assume that production is carried on evenly throughout the year (360 days) and wages and overheads accrue similarly. All sales are on the credit basis. You are required to CALCULATE the Net Working Capital Requirement on Cash Cost Basis.

(RTP May – 2020)

Solution:**Calculation of Net Working Capital requirement:**

	(₹)	(₹)
A. Current Assets:		
Inventories:		
Stock of Raw material (Refer to Working note (iii))	1,44,000	
Stock of Work in progress (Refer to Working note (ii))	7,50,000	
Stock of Finished goods (Refer to Working note (iv))	20,40,000	

Debtors for Sales(Refer to Working note (v))	1,02,000	
Cash	2,00,000	
Gross Working Capital	32,36,000	32,36,000
B. Current Liabilities:		
Creditors for Purchases (Refer to Working note (vi))	1,56,000	
Creditors for wages (Refer to Working note (vii))	23,250	
	1,79,250	1,79,250
Net Working Capital (A - B)		30,56,750

Working Notes:**(i) Annual cost of production**

	(₹)
Raw material requirements {(31,200 × ₹ 40) + (12,000 × ₹ 40)}	17,28,000
Direct wages {(31,200 × ₹ 15) + (12,000 × ₹ 15 × 0.5)}	5,58,000
Overheads (exclusive of depreciation) {(31,200 × ₹ 30) + (12,000 × ₹ 30 × 0.5)}	11,16,000
Gross Factory Cost 34,02,000 Less: Closing W.I.P [12,000 (₹ 40 + ₹ 7.5 + ₹ 15)]	(7,50,000)
Cost of Goods Produced	26,52,000
Less: Closing Stock of Finished Goods (₹ 26,52,000 × 24,000/31,200)	(20,40,000)
Total Cash Cost of Sales*	6,12,000

[*Note: Alternatively, Total Cash Cost of Sales = (31,200 units – 24,000 units) × (₹ 40 + ₹ 15 + ₹ 30) = ₹ 6,12,000]

(ii) Work in progress stock

	(₹)
Raw material requirements (12,000 units × ₹ 40)	4,80,000
Direct wages (50% × 12,000 units × ₹ 15)	90,000
Overheads (50% × 12,000 units × ₹ 30)	1,80,000
	7,50,000

(iii) Raw material stock

It is given that raw material in stock is average 30 days consumption. Since, the company is newly formed; the raw material requirement for production and work in progress will be issued and consumed during the

year. Hence, the raw material consumption for the year (360 days) is as follows:

	(₹)
For Finished goods (31,200 × ₹ 40)	12,48,000
For Work in progress (12,000 × ₹ 40)	4,80,000
	17,28,000

$$\text{Raw material stock} = \frac{17,28,000}{360 \text{ days}} \times 30 \text{ days} = ₹1,44,000$$

(iv) Finished goods stock:

$$24,000 \text{ units @ ₹ (40 + 15 + 30) per unit} = ₹ 20,40,000$$

(v) Debtors for sale: ₹ 6,12,000 × $\frac{60 \text{ days}}{360 \text{ days}}$ = ₹1,02,000

(vi) Creditors for raw material Purchases [Working Note (iii)]:

$$\text{Annual Material Consumed (₹12,48,000 + ₹4,80,000)} \quad ₹17,28,000$$

$$\text{Add: Closing stock of raw material} \\ [(₹17,28,000 \times 30 \text{ days}) / 360 \text{ days}] \quad \underline{₹ 1,44,000}$$

$$\underline{₹ 18,72,000}$$

$$\text{Credit allowed by suppliers} = \frac{₹ 18,72,000}{360 \text{ days}} \times 30 \text{ days} = ₹1,56,000$$

(vii) Creditors for wages:

$$\text{Outstanding wage payment} = [(31,200 \text{ units} \times ₹ 15) + (12,000 \text{ units} \times ₹ 15 \times .50)] \times 15 \text{ days} / 360 \text{ days}$$

$$= \frac{₹ 5,58,000}{360 \text{ days}} \times 15 \text{ days} = ₹ 23,250$$

Question – 19

MT Ltd. has been operating its manufacturing facilities till 31.3.2021 on a single shift working with the following cost structure:

	Per Unit (₹)
Cost of Materials	24
Wages (out of which 60% variable)	20
Overheads (out of which 20% variable)	20
	64
Profit	8
Selling Price	72

As at 31.03.2021 with the sales of ₹ 17,28,000 the company held:

	Per Unit (₹)
Stock of raw materials (at cost)	1,44,000
Work-in-progress (valued at prime cost)	88,000
Finished goods (valued at total cost)	2,88,000
Sundry debtors	4,32,000

In view of increased market demand, it is proposed to double production by working an extra shift. It is expected that a 10% discount will be available from suppliers of raw materials in view of increased volume of business. Selling price will remain the same. The credit period allowed to customers will remain unaltered. Credit availed from suppliers will continue to remain at the present level i.e. 2 months. Lag in payment of wages and overheads will continue to remain at one month.

You are required to CALCULATE the additional working capital requirements, if the policy to increase output is implemented, to assess the impact of double shift for long term as a matter of production policy.

(RTP May – 2021)

Solution:

Workings:

(1) Statement of cost at single shift and double shift working

	24,000 units		48,000 Units	
	Per unit (₹)	Total(₹)	Per unit (₹)	Total (₹)

Raw materials	24	5,76,000	21.6	10,36,000
Wages:				
Variable	12	2,88,000	12	5,76,000
Fixed	8	1,92,000	4	1,92,000
Overheads:				
Variable	4	96,000	4	1,92,000
Fixed	16	3,84,000	8	3,84,000
Total cost	64	15,36,000	49.6	23,80,800
Profit	8	1,92,000	22.4	10,75,200
Sales	72	17,28,000	72	34,56,000

$$(2) \quad \text{Sales in units 2020-21} = \frac{\text{sales}}{\text{Unit selling price}} = \frac{\text{₹ } 17,28,000}{\text{₹ } 72} = 24,000 \text{ units}$$

$$(3) \quad \text{Stock of Raw Materials in units on 31.3.2021}$$

$$= \frac{\text{Value of stock}}{\text{Cost per unit}} = \frac{\text{₹ } 1,44,000}{\text{₹ } 24} = 6,000 \text{ units}$$

$$(4) \quad \text{Stock of work-in-progress in units on 31.3.2021}$$

$$= \frac{\text{Value of work-in-progress}}{\text{Prime Cost per unit}} = \frac{\text{₹ } 88,000}{\text{₹ } (24 + 20)} = 2,000 \text{ units}$$

$$(5) \quad \text{Stock of finished goods in units 2020-21}$$

$$= \frac{\text{Value of stock}}{\text{Total Cost per unit}} = \frac{\text{₹ } 2,88,000}{\text{₹ } 64} = 4,500 \text{ units}$$

Comparative Statement of Working Capital Requirement

	Single Shift (24,000 units)			Double Shift (48,000 units)		
	Units	Rate (₹)	Amount (₹)	Units	Rate (₹)	Amount (₹)
Current Assets						
Inventories:						
Raw Materials	6,000	24	1,44,000	12,000	21.6	2,59,200
Work-in-Progress	2,000	44	88,000	2,000	37.6	75,200
Finished Goods	4,500	64	2,88,000	9,000	49.6	4,46,400
Sundry Debtors	6,000	64	3,84,000	12,000	49.6	5,95,200

Total Current Assets (A)			9,04,000			13,76,000
Current Liabilities						
Creditors for Materials	4,000	24	96,000	8,000	21.6	1,72,800
Creditors for Wages	2,000	20	40,000	4,000	16	64,000
Creditors for Overheads	2,000	20	40,000	4,000	12	48,000
Total Current Liabilities (B)			1,76,000			2,84,800
Working Capital (A) – (B)			7,28,000			10,91,200

Analysis: Additional Working Capital requirement = ₹ 10,91,200 – ₹ 7,28,000 = ₹ 3,63,200, if the policy to increase output is implemented.

Question – 20

While applying for financing of working capital requirements to a commercial bank, TN Industries Ltd. projected the following information for the next year:

Cost Element	Per Unit (₹)	Per Unit (₹)
Raw Materials		
X	30	
Y	7	
Z	6	43
Direct Labour		25
Manufacturing and administration overheads (excluding depreciation)		20
Depreciation		10
Selling overheads		15
		113

Additional Information:

- Raw Materials are purchased from different suppliers leading to different credit period allowed as follows: X – 2 months; Y– 1 months; Z – ½ month
- Production cycle is of ½ month. Production process requires full unit of X and Y in the beginning of the production. Z is required only to the extent of half unit in the beginning and the remaining half unit is needed at a uniform rate during the production process.
- X is required to be stored for 2 months and other materials for 1 month.
- Finished goods are held for 1 month.
- 25% of the total sales is on cash basis and remaining on credit basis. The credit allowed by debtors is 2 months.

- (f) Average time lag in payment of all overheads is 1 months and $\frac{1}{2}$ months for direct labour.
- (g) Minimum cash balance of ₹ 8,00,000 is to be maintained.

CALCULATE the estimated working capital required by the company on cash cost basis if the budgeted level of activity is 1,50,000 units for the next year. The company also intends to increase the estimated working capital requirement by 10% to meet the contingencies. (You may assume that production is carried on evenly throughout the year and direct labour and other overheads accrue similarly.)

(RTP May – 2021)

Solution:

Statement showing Working Capital Requirements of TN Industries Ltd. (on cash cost basis)

	Amount in (₹)	Amount in (₹)
A. Current Assets		
(i) Inventories:		
Raw material		
X $\left[\frac{1,50,000 \text{ units} \times ₹ 30}{12 \text{ months}} \times 2 \text{ months} \right]$	7,50,000	
Y $\left[\frac{1,50,000 \text{ unit} \times ₹ 7}{12 \text{ months}} \times 1 \text{ month} \right]$	87,500	
Z $\left[\frac{1,50,000 \text{ units} \times ₹ 6}{12 \text{ months}} \times 1 \text{ month} \right]$	75,000	
WIP $\left[\frac{1,50,000 \text{ units} \times ₹ 64}{12 \text{ months}} \times 0.5 \text{ month} \right]$	4,00,000	
Finished goods $\left[\frac{1,50,000 \text{ units} \times ₹ 88}{12 \text{ months}} \times 1 \text{ month} \right]$	11,00,000	24,12,500
(ii) Receivables (Debtors) $\left[\frac{1,50,000 \text{ units} \times ₹ 103}{12 \text{ months}} \times 2 \text{ months} \right] \times 0.75$		19,31,250
(iii) Cash and bank balance		8,00,000
Total Current Assets		51,43,750
B. Current Liabilities:		

(i)	Payables (Creditors) for Raw materials		
	X [$\frac{1,50,000 \text{ units} \times ₹ 30}{12 \text{ month}} \times 2 \text{ months}$]	7,50,000	
	Y [$\frac{1,50,000 \text{ units} \times ₹ 7}{12 \text{ months}} \times 1 \text{ month}$]	87,500	
	Z [$\frac{1,50,000 \text{ units} \times ₹ 6}{12 \text{ months}} \times 0.5 \text{ month}$]	37,500	8,75,000
(ii)	Outstanding Direct Labour $\frac{1,50,000 \text{ units} \times ₹ 25}{12 \text{ months}} \times 0.5 \text{ month}$		1,56,250
(iii)	Outstanding Manufacturing and administration $\frac{1,50,000 \text{ units} \times ₹ 20}{12 \text{ months}} \times 1 \text{ month}$		2,50,000
(iv)	Outstanding Selling overheads $\frac{1,50,000 \text{ units} \times ₹ 15}{12 \text{ months}} \times 1 \text{ month}$		1,87,500
Total Current Liabilities			14,68,750
Net Working Capital Needs (A – B)			36,75,000
Add: Provision for contingencies @ 10%			3,67,500
Working capital requirement			40,42,500

Workings:

1.

(i) Computation of Cash Cost of Production	Per unit (₹)
Raw Material consumed	43
Direct Labour	25
Manufacturing and administration overheads	20
Cash cost of production	88
(ii) Cash cost of production	Per unit (₹)
Cash cost of production as in (i) above	88
Selling overheads	15
Cash cost of sales	103

2. Calculation of cost of WIP

Particulars	Per unit (₹)
Raw material (added at the beginning):	
X	30
Y	7

Z ($\text{₹ } 6 \times 50\%$)	3
Cost during the year:	
Z $\{(\text{₹ } 6 \times 50\%) \times 50\%\}$	1.5
Direct Labour ($\text{₹ } 25 \times 50\%$)	12.5
Manufacturing and administration overheads ($20 \times 50\%$)	10
	64

Question – 21

You are given below the Profit & Loss Accounts for two years for a company:

Profit and Loss Account

	Year 1	Year 2		Year 1	Year 2
	(₹)	(₹)		(₹)	(₹)
To Opening Stock	32,00,000	40,00,000	By Sales	3,20,00,000	4,00,00,000
To Raw Materials	1,20,00,000	1,60,00,000	By Closing stock	40,00,000	60,00,000
To Stores	38,40,000	48,00,000	By Misc. Income	4,00,000	4,00,000
To Manufacturing Expenses	51,20,000	64,00,000			
To Other Expenses	40,00,000	40,00,000			
To Depreciation	40,00,000	40,00,000			
To Net Profit	42,40,000	72,00,000		-	-
	3,64,00,000	4,64,00,000		3,64,00,000	4,64,00,000

Sales are expected to be ₹ 4,80,00,000 in year 3.

As a result, other expenses will increase by ₹ 20,00,000 besides other charges. Only raw materials are in stock. Assume sales and purchases are in cash terms and the closing stock is expected to go up by the same amount as between year 1 and 2. You may assume that no dividend is being paid. The Company can use 75% of the cash generated to service a loan. COMPUTE how much cash from operations will be available in year 3 for the purpose? Ignore income tax.

(RTP May – 2022)

Solution:**Projected Profit and Loss Account for the year 3**

Particulars	Year 2 Actual (₹ in lakhs)	Year 3 Projected (₹ in lakhs)	Particulars	Year 2 Actual (₹ in lakhs)	Year 3 Projected (₹ in lakhs)
To Materials consumed	140.00	168.00	By Sales	400.00	480.00
To Stores	48.00	57.60	By Misc. Income	4.00	4.00
To Mfg. Expenses	64.00	76.80			
To Other expenses	40.00	60.00			
To Depreciation	40.00	40.00			
To Net profit	72.00	81.60			
	404.00	484.00		484.00	484.00

Cash Flow:

Particulars	(₹ in lakhs)
Profit	81.60
Add: Depreciation	40.00
	121.60
Less: Cash required for increase in stock	20.00
Net cash inflow	101.60

Available for servicing the loan: 75% of ₹ 1,01,60,000 or ₹ 76,20,000

Working Notes:

(i) Material consumed in year 1 = $(32 + 120 - 40)/320 = 35\%$

Material consumed in year 2 = $(40 + 160 - 60)/400 = 35\%$

Likely consumption in year 3 = $480 \times \frac{35}{100} = ₹ 168 \text{ (lakhs)}$

(ii) Stores are 12% of sales & Manufacturing expenses are 16% of sales for both the years.

Question – 22

PQR Ltd., a company newly commencing business in the year 2021-22, provides the following projected Profit and Loss Account:

	(₹)	(₹)
Sales		5,04,000
Cost of goods sold		<u>3,67,200</u>
Gross Profit		1,36,800
Administrative Expenses	33,600	
Selling Expenses	<u>31,200</u>	<u>64,800</u>
Profit before tax		72,000
Provision for taxation		<u>24,000</u>
Profit after tax		<u>48,000</u>
The cost of goods sold has been arrived at as under:		
Materials used	2,01,600	
Wages and manufacturing Expenses	1,50,000	
Depreciation	<u>56,400</u>	
	4,08,000	
Less: Stock of Finished goods (10% of goods produced not yet sold)	<u>40,800</u>	
	<u>3,67,200</u>	

The figure given above relate only to finished goods and not to work-in-progress. Goods equal to 15% of the year's production (in terms of physical units) will be in process on the average requiring full materials but only 40% of the other expenses. The company believes in keeping materials equal to two months' consumption in stock.

All expenses will be paid one month in advance. Suppliers of materials will extend 1-1/2 months credit. Sales will be 20% for cash and the rest at two months' credit. 70% of the Income tax will be paid in advance in quarterly installments. The company wishes to keep ₹ 19,200 in cash. 10% must be added to the estimated figure for unforeseen contingencies.

PREPARE an estimate of working capital.

(RTP May – 2022)

Solution:

Statement showing the requirements of Working Capital

Particulars	(₹)	(₹)
A. Current Assets:		
Inventory:		
Stock of Raw material ($₹ 2,31,840 \times 2/12$)	38,640	
Stock of Work-in-progress (As per Working Note)	39,240	

Stock of Finished goods ($\text{₹ } 3,51,600 \times 10/100$)	35,160	
Receivables (Debtors) ($\text{₹ } 3,04,992 \times 2/12$)	50,832	
Cash in Hand	19,200	
Prepaid Expenses:		
Wages & Mfg. Expenses ($\text{₹ } 1,59,000 \times 1/12$)	13,250	
Administrative expenses ($\text{₹ } 33,600 \times 1/12$)	2,800	
Selling & Distribution Expenses ($\text{₹ } 31,200 \times 1/12$)	2,600	
Advance taxes paid $\{(70\% \text{ of } \text{₹ } 24,000) \times 3/12\}$	4,200	
Gross Working Capital	2,05,922	2,05,922
B. Current Liabilities:		
Payables for Raw materials ($\text{₹ } 2,70,480 \times 1.5/12$)	33,810	
Provision for Taxation (Net of Advance Tax) ($\text{₹ } 24,000 \times 30/100$)	7,200	
Total Current Liabilities	41,010	41,010
C. Excess of CA over CL		1,64,912
Add: 10% for unforeseen contingencies		16,491
Net Working Capital requirements		1,81,403

Working Notes:**(i) Calculation of Stock of Work-in-progress**

Particulars	(₹)
Particulars (₹) Raw Material ($\text{₹ } 2,01,600 \times 15\%$)	30,240
Wages & Mfg. Expenses ($\text{₹ } 1,50,000 \times 15\% \times 40\%$)	9,000
Total	39,240

(ii) Calculation of Stock of Finished Goods and Cost of Sales

Particulars	(₹)
Direct material Cost [$\text{₹ } 2,01,600 + \text{₹ } 30,240$]	2,31,840
Wages & Mfg. Expenses [$\text{₹ } 1,50,000 + \text{₹ } 9,000$]	1,59,000
Depreciation	0
Gross Factory Cost	3,90,840
Less: Closing W.I.P.	(39,240)
Cost of goods produced	3,51,600
Add: Administrative Expenses	33,600
	3,85,200
Less: Closing stock	(35,160)
Cost of Goods Sold	3,50,040
Add: Selling and Distribution Expenses	31,200
Total Cash Cost of Sales	3,81,240
Debtors (80% of cash cost of sales)	3,04,992

(iii) Calculation of Credit Purchase

Particulars	(₹)
Raw material consumed	2,31,840
Add: Closing Stock	38,640
Less: Opening Stock	-
Purchases	2,70,480

Question – 23

Kalyan limited has provided you the following information for the year 2021-22:

By working at 60% of its capacity the company was able to generate sales of ₹ 72,00,000. Direct labour cost per unit amounted to ₹ 20 per unit. Direct material cost per unit was 40% of the selling price per unit. Selling price was 3 times the direct labour cost per unit. Profit margin was 25% on the total cost.

For the year 2022-23, the company makes the following estimates:

Production and sales will increase to 90% of its capacity. Raw material per unit price will remain unchanged. Direct expense per unit will increase by 50%. Direct labour per unit will increase by 10%. Despite the fluctuations in the cost structure, the company wants to maintain the same profit margin on sales.

Raw materials will be in stock for one month whereas finished goods will remain in stock for two months. Production cycle is for 2 months. Credit period allowed by suppliers is 2 months. Sales are made to three zones:

Zone	Percentage of Sale	Mode of Credit
A	50%	Credit period of 2 months
B	30%	Credit period of 3 months
C	20%	Cash Sales

There are no cash purchase and cash balance will be ₹ 1,11,000

The company plans to apply for a working capital financing from bank for the year 2022- 23. ESTIMATE Net Working Capital of the Company receivables to be taken on sales and also COMPUTE the maximum permissible bank finance for the company using 3 criteria of Tandon Committee Norms. (Assume stock of finished goods to be a core current asset)

(RTP May – 2023)

Solution:**Cost Structure**

Particulars	Calculations	2021-22		Calculations	2022-23	
		P.U.	Amount (p.u. X units)		P.U.	Amount (p. u. X units)
Direct Material	40% of SP	₹ 24	₹ 28,80,000	Same as PY	₹ 24	₹ 43,20,000
Direct labour	Given	₹ 20	₹ 24,00,000	20*1.1	₹ 22	₹ 39,60,000
Direct Expenses	bal. fig.	₹ 4	₹ 4,80,000	4*1.5	₹ 6	₹ 10,80,000
Total Cost	SP - Profit	₹ 48	₹ 57,60,000		₹ 52	₹ 93,60,000
Profit	(SP/125 × 25)	₹ 12	₹ 14,40,000	52*25%	₹ 13	₹ 23,40,000
Sales	3 × Direct Labour p.u.	₹ 60	₹ 72,00,000		₹ 65	₹ 1,17,00,000
*units=		₹ 72,00,000 / ₹ 60 = 1,20,000			1,20,000/60 × 90 = 1,80,000	

Operating Cycle

Raw material holding period	1 month
Finished Goods holding period	2 months
WIP conversion period	2 months
Creditor Payment Period	2 months
Receivables Collection Period	2/3 months

Estimation of Working Capital		
Particulars	Calculation	Amount
Current Assets		
Stock of Raw Material	43,20,000 × 1/12	
Stock of WIP		
RM cost	₹ 43,20,000	
Labour cost	₹ 19,80,000	
Direct Exp cost	₹ 5,40,000	
Total WIP Cost	₹ 68,40,000	
Stock of WIP	68,40,000 × 2/12	₹ 11,40,000
Stock of Finished Goods	93,60,000 × 2/12	₹ 15,60,000
Receivables (on sales)		
A	1,17,00,000 × 50% × 2/12	₹ 9,75,000
B	1,17,00,000 × 30% × 3/12	₹ 8,77,500
C	NIL	-
Cash Balance	Given	₹ 1,11,000
Total Current Assets		₹ 50,23,500
Current Liabilities		
Payables	*₹ 44,40,000 × 2/12	₹ 7,40,000

Net Working Capital	₹ 42,83,500
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Opening RM stock = $28,80,000 \times 1/12 = ₹ 2,40,000$

* RM purchased = RM consumed – Opening Stock + Closing Stock

= ₹ 43,20,000 – ₹ 2,40,000 + ₹ 3,60,000

= ₹ 44,40,000

Computation of Maximum Permissible Bank Finance			
Method	Formula	Calculation	₹
I	$75\% \times (\text{Current Assets} - \text{Current Liabilities})$	$75\% \times (₹ 50,23,500 - ₹ 7,40,000)$	₹ 32,12,625
II	$75\% \times \text{Current Assets} - \text{Current Liabilities}$	$75\% \times ₹ 50,23,500 - ₹ 7,40,000$	₹ 30,27,625
III	$75\% \times (\text{Current Assets} - \text{Core CA}) - \text{Current Liabilities}$	$75\% \times (₹ 50,23,500 - ₹ 15,60,000) - ₹ 7,40,000$	₹ 18,57,625

Question – 24

PQ Ltd. has commenced new business segment in 2023-24. The following information has been ascertained for annual production of 25,000 units which is the full capacity.

	Cost per unit (₹)
Material	100
Labour and variable overhead expenses	50
Fixed manufacturing expenses	35
Depreciation	15
Selling expenses (80% variable)	10

In the first two years of operations, production and sales are expected to be as follows:

Year	Production (No. of units)	Sales (No. of units)
1	12,000	10,000
2	18,000	9,000

The selling price is expected to be ₹ 250 .

To assess the working capital requirements, the following additional information is available:

(a)	Stock of materials	2 months' average consumption
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(b)	Debtors	1.5 month's average sales.
(c)	Cash balance	₹ 50,000
(d)	Creditors for supply of materials	1 month's average purchase during the year.
(e)	Expenses	All expenses will be paid 1 month in advance during the year.

Goods equal to 15% of the year's production (in terms of physical units) will be in process on the average requiring full materials but only 40% of the other expenses.

The management is also of the opinion to make 10% margin for contingencies on computed figure and value the closing stock at cost of production.

PREPARE, for the two years:

- A projected statement of Profit/Loss (Ignoring taxation); and
- A projected statement of working capital requirements on a cash cost basis.

(RTP May – 2024)

Solution:

(i)

PQ Limited Projected Statement of Profit / Loss (Ignoring Taxation)

	Year 1	Year 2
Production (Units)	12,000	18,000
Sales (Units)	10,000	19,000
	(₹)	(₹)
Sales revenue (A) (Sales unit × ₹ 250)	25,00,000	47,50,000
Cost of production:		
Materials cost (Units produced × ₹ 100)	12,00,000	18,00,000
Direct labour and variable expenses (Units produced × ₹ 50)	6,00,000	9,00,000
Fixed manufacturing expenses (Production Capacity: 25,000 units × ₹ 35)	8,75,000	8,75,000
Depreciation (Production Capacity: 25,000 units × ₹ 15)	3,75,000	3,75,000
Gross Factory Cost	30,50,000	39,50,000
Add: Opening W.I.P.	-	2,91,000

Less: Closing W.I.P.	2,91,000	3,99,000
Cost of goods produced	27,59,000	38,42,000
Add: Opening stock of finished goods (Year 1 : Nil; Year 2 : 2,000 units)	-	4,59,833
Cost of Goods available for sale (Year 1: 12,000 units; Year 2: 20,000 units)	27,59,000	43,01,833
Less: Closing stock of finished goods at average cost		
(year 1: 2000 units, year 2 : 1000 units) (Cost of Production $\times$ Closing stock/ units produced)	4,59,833	2,13,444
Cost of Goods Sold	22,99,167	40,88,389
Add: Selling expenses – Variable (Sales unit $\times$ ₹ 8)	80,000	1,52,000
Add: Selling expenses -Fixed (25,000 units $\times$ ₹ 2)	50,000	50,000
Cost of Sales : (B)	24,29,167	42,90,389
Profit (+) / Loss (-): (A - B)	70,833	4,59,611

Working Notes:**Calculation of Stock of Work-in-progress**

Particulars	Year 1	Year 2
	(₹)	(₹)
Raw Material (material cost $\times$ 15%)	1,80,000	2,70,000
Labour & Mfg. Expenses (Labour & mfg. expenses $\times$ 15% $\times$ 40%)	88,500	1,06,500
Depreciation (Depreciation $\times$ 15% $\times$ 40%)	22,500	22,500
Total	2,91,000	3,99,000

1. Calculation of creditors for supply of materials:

	Year 1 (₹)	Year 2 (₹)
Materials consumed during the year	12,00,000	18,00,000
Add: Closing stock (2 month's average consumption)	2,00,000	3,00,000
	14,00,000	21,00,000
Less: Opening Stock	-	2,00,000
Purchases during the year	14,00,000	19,00,000
Average purchases per month (Creditors)	1,16,667	1,58,333

2. Prepayment for expenses:

	Year 1 (₹)	Year 2 (₹)
Direct labour and variable expenses	6,00,000	9,00,000
Fixed manufacturing expenses	8,75,000	8,75,000
Selling expenses (variable + fixed)	1,30,000	2,02,000
Total	16,05,000	19,77,000
Average per month	1,33,750	1,64,750

(ii) Projected Statement of Working Capital Requirement (Cash Cost Basis)

	Year 1 (₹)	Year 2 (₹)
(A) Current Assets		
Inventories:		
- Stock of Raw Material (12,000 units ₹ 100 2/12); (18,000 units ₹ 100 2/12)	2,00,000	3,00,000
- Finished Goods (Refer working note 3)	4,01,083	1,92,611
- Work In Process (Refer working note 5)	2,68,500	3,76,500
Receivables (Debtors) (Refer working note 4)	2,66,927	4,84,684
Prepayment for Expenses (Refer working note 2)	1,33,750	1,64,750
Minimum Cash balance	50,000	50,000
Total Current Assets/ Gross working capital (A)	13,20,260	15,68,545
(B) Current Liabilities		
Creditors for raw material (Refer working note 1)	1,16,667	1,58,333
Total Current Liabilities	1,16,667	1,58,333
Net Working Capital (A – B)	12,03,594	14,10,212
Add: 10% contingency margin	1,20,359	1,41,021
Total Working capital required	13,23,953	15,51,233

Working Note:**3. Cash Cost of Production:**

	Year 1 (₹)	Year 2 (₹)
Gross Factory Cost as per projected	30,50,000	39,50,000

Statement of P&L		
Add: Opening W.I.P	-	2,68,500
Less: Closing W.I.P	2,68,500	3,76,500
Cost of goods produced	27,81,500	38,42,000
Less: Depreciation	(3,75,000)	(3,75,000)
Cash Cost of Production	24,06,500	34,67,000
Add: Opening Stock at Average Cost:	-	4,01,083
Cash Cost of Goods Available for sale	24,06,500	38,68,083
Less: Closing Stock at Avg. Cost	4,01,083	1,92,611
$\left(\frac{₹ 24,06,500 \times 2,000}{12,000} \right)$		
$\left(\frac{₹ 44,67,000 \times 1,000}{18,000} \right)$		
Cash Cost of Goods Sold	20,05,417	36,75,472

4. Receivables (Debtors)

	Year 1 (₹)	Year 2 (₹)
Cash Cost of Goods Sold	20,05,417	36,75,472
Add: Selling expenses – Variable (Sales unit × ₹ 8)	80,000	1,52,000
Add: Selling expenses -Fixed (25,000 units × ₹ 2)	50,000	50,000
Cash Cost of Debtors	21,35,417	38,77,472
Average Debtors	2,66,927	4,84,684

Calculation of Stock of Work-in-progress (Cash Cost Basis)

Particulars		(₹)
Raw Material (material cost × 15%)	1,80,000	2,70,000
Labour & Mfg. Expenses (Labour & mfg. expenses × 15% × 40%)	88,500	1,06,500
Total	2,68,500	3,76,500

Question – 25

Following are cost information of KG Ltd., which has commenced a new project for an annual production of 24,000 units which is the full capacity:

	Costs per unit (₹)
Materials	80.00
Direct labour and variable expenses	40.00
Fixed manufacturing expenses	12.00
Depreciation	20.00

Fixed administration expenses	8.00
	160.00

The selling price per unit is expected to be ₹ 192 and the selling expenses ₹ 10 per unit, 80% of which is variable.

In the first two years of operations, production and sales are expected to be as follows:

Year	Production (No. of units)	Sales (No. of units)
1	12,000	10,000
2	8,000	17,000

To assess the working capital requirements, the following additional information is available:

- (a) Stock of market 2 months of average consumption
- (b) Work in progress NIL
- (c) Debtors 2 month's average sales.
- (d) Cash balance 1,00,000
- (e) Creditors for supply of materials 1 month's average purchase during the year.
- (f) Creditor for expenses 1 month's average of all expenses during the year.

PREPARE, for the two years:

- (i) A projected statement of Profit/Loss (Ignoring taxation); and
- (ii) A projected statement of working capital requirements

(RTP Nov – 2019)

Solution:

**(i) Projected Statement of Profit / Loss
(Ignoring Taxation)**

	Year 1	Year 2
Production (Units)	12,000	18,000
Sales (Units)	10,000	17,000

	(₹)	(₹)
Sales revenue (A) (Sales unit × ₹ 192)	19,20,000	32,64,000
Cost of production:		
Materials cost (Units produced × ₹ 80)	9,60,000	14,40,000
Direct labour and variable expenses (Units produced × ₹ 40)	4,80,000	7,20,000
Fixed manufacturing expenses (Production Capacity: 24,000 units × ₹ 12)	2,88,000	2,88,000
Depreciation (Production Capacity : 24,000 units × ₹ 20)	4,80,000	4,80,000
Fixed administration expenses (Production Capacity : 24,000 units × ₹ 8)	1,92,000	1,92,000
Total Costs of Production	24,00,000	31,20,000
Add: Opening stock of finished goods (Year 1 : Nil; Year 2 : 2,000 units)	---	4,00,000
Cost of Goods available for sale (Year 1: 12,000 units; Year 2: 20,000 units)	24,00,000	35,20,000
Less: Closing stock of finished goods at average cost (year 1: 2000 units, year 2 : 3000 units) (Cost of Production × Closing stock/units produced)	(4,00,000)	(5,28,000)
Cost of Goods Sold	20,00,000	29,92,000
Add: Selling expenses–Variable (Sales unit × ₹ 8)	80,000	1,36,000
Add: Selling expenses -Fixed (24,000 units × ₹ 2)	48,000	48,000
Cost of Sales : (B)	21,28,000	31,76,000
Profit (+) / Loss (-): (A - B) (-)	2,08,000	(+) 88,000

Working Notes:**1. Calculation of creditors for supply of materials:**

	Year 1 (₹)	Year 2 (₹)
Materials consumed during the year	9,60,000	14,40,000
Add: Closing stock (2 month's average consumption)	1,60,000	2,40,000
	11,20,000	16,80,000
Less: Opening Stock	---	1,60,000
Purchases during the year	11,20,000	15,20,000
Average purchases per month (Creditors)	93,333	1,26,667

2. Creditors for expenses:

	Year 1 (₹)	Year 2 (₹)
Direct labour and variable expenses	4,80,000	7,20,000
Fixed manufacturing expenses	2,88,000	2,88,000
Fixed administration expenses	1,92,000	1,92,000
Selling expenses (variable + fixed)	1,28,000	1,84,000
Total	10,88,000	13,84,000
Average per month	90,667	1,15,333

(ii) Projected Statement of Working Capital requirements

	Year 1 (₹)	Year 2 (₹)
Current Assets:		
Inventories:		
- Stock of materials (2 month's average consumption)	1,60,000	2,40,000
- Finished goods	4,00,000	5,28,000
Debtors (2 month's average sales) (including profit)	3,20,000	5,44,000
Cash	1,00,000	1,00,000
Total Current Assets/ Gross working capital (A)	9,80,000	14,12,000
Current Liabilities:		
Creditors for supply of materials (Refer to working note 1)	93,333	1,26,667
Creditors for expenses (Refer to working note 2)	90,667	1,15,333
Total Current Liabilities: (B)	1,84,000	2,42,000
Estimated Working Capital Requirements: (A-B)	7,96,000	11,70,000

Question – 26

The management of Trux Company Ltd. is planning to expand its business and consults you to prepare an estimated working capital statement. The records of the company reveals the following annual information:

	(₹)
Sales – Domestic at one month's credit	18,00,000
Export at three month's credit (sales price 10% below domestic price)	8,10,000
Materials used (suppliers extend two months credit)	6,75,000
Lag in payment of wages – $\frac{1}{2}$ month	5,40,000
Lag in payment of manufacturing expenses (cash) – 1 month	7,65,000

Lag in payment of Administration Expenses – 1 month	1,80,000
Selling expenses payable quarterly in advance	1,12,500
Income tax payable in four instalment's of which one falls in the next financial year	1,68,000

Rate of gross profit is 20%. Ignore work-in-progress and depreciation.

The company keeps one month's stock of raw materials and finished goods (each) and believes in keeping ₹ 2,50,000 available to it including the overdraft limit of ₹ 75,000 not yet utilized by the company.

The management is also of the opinion to make 10% margin for contingencies on computed figure.

You are required to PREPARE the estimated working capital statement for the next year.

(RTP Nov – 2021)

Solution:

Preparation of Statement of Working Capital Requirement for Trux Company Ltd.

	(₹)	(₹)
A. Current Assets		
(i) Inventories:		
Material (1 month) $\left(\frac{₹ 6,75,000}{₹ 12 \text{ month}} \times 1 \text{ month} \right)$	56,250	
Finished goods (1 month) $\left(\frac{₹ 21,60,000}{₹ 12 \text{ month}} \times 1 \text{ month} \right)$	1,80,000	2,36,250
(ii) Receivables (Debtors)		
For Domestic Sales $\left(\frac{₹ 15,17,586}{12 \text{ month}} \times 1 \text{ month} \right)$	1,26,466	
For Export Sales $\left(\frac{₹ 7,54,914}{12 \text{ month}} \times 3 \text{ month} \right)$	1,88,729	3,15,195
(iii) Prepayment of Selling expenses		28,125

	$\left(\frac{₹ 1,12,500}{12 \text{ month}} \times 3 \text{ month} \right)$		
(iii)	Cash in hand & at bank		1,75,000
	Total Current Assets		7,54,570
B. Current Liabilities:			
(i)	Payables (Creditors) for materials (2 months) $\left(\frac{₹ 6,75,000}{12 \text{ month}} \times 2 \text{ month} \right)$		1,12,500
(ii)	Outstanding wages (0.5 months) $\left(\frac{₹ 5,40,000}{12 \text{ month}} \times 0.5 \text{ month} \right)$		22,500
(iii)	Outstanding manufacturing expenses $\left(\frac{₹ 7,65,000}{12 \text{ month}} \times 1 \text{ month} \right)$		63,750
(iv)	Outstanding administrative expense $\left(\frac{₹ 1,80,000}{12 \text{ month}} \times 1 \text{ month} \right)$		15,000
(v)	Income tax payable		42,000
	Total Current Liabilities		2,55,750
	Net Working Capital (A – B)		4,98,820
	Add: 10% contingency margin		49,882
	Total Working Capital required		5,48,702

Working Notes:**1. Calculation of Cost of Goods Sold and Cost of Sales**

	Domestic (₹)	Export (₹)	Total (₹)
Domestic Sales	18,00,000	8,10,000	26,10,000
Less: Gross profit @ 20% on domestic sales and 11.11% on export sales (Working note-2)	3,60,000	90,000	4,50,000
Cost of Goods Sold	14,40,000	7,20,000	21,60,000
Add: Selling expenses (Working note-3)	77,586	34,914	1,12,500
Cash Cost of Sales	15,17,586	7,54,914	22,72,500

2. Calculation of gross profit on Export Sales

Let domestic selling price is ₹ 100. Gross profit is ₹ 20, and then cost per unit is ₹ 80

Export price is 10% less than the domestic price i.e. $100 - (1 - 0.1) = 90$

Now, gross profit will be = ₹ 90 – ₹ 80 = ₹ 10

So, Gross profit ratio at export price will be = $\frac{₹ 10}{₹ 90} \times 100 = 11.11\%$

3. Apportionment of Selling expenses between Domestic and Exports sales:

Apportionment on the basis of sales value:

$$\text{Domestic Sales} = \frac{₹ 1,12,500}{₹ 26,10,000} \times ₹ 18,00,000 = ₹ 77,586$$

$$\text{Exports Sales} = \frac{₹ 1,12,500}{₹ 26,10,000} \times ₹ 8,10,000 = ₹ 34,914$$

4. Assumptions

- (i) It is assumed that administrative expenses is related to production activities.
- (ii) Value of opening and closing stocks are equal.

Question – 27

Trading and Profit and Loss Account of Beat Ltd. for the year ended 31st March, 2022 is given below:

Particulars	Amount (₹)	Amount (₹)	Particulars	Amount (₹)	Amount (₹)
To opening stock :			By Sales(Credit)		1,60,00,000
-Raw Materials	14,40,000		By Closing Stock:		
-Work-in-progress	4,80,000		- Raw Materials	16,00,00	
- Finished Goods	<u>20,80,000</u>	40,00,000	- Work-in progress	8,00,000	
To Purchases (credit)		88,00,000	- Finished		48,00,000

To Wages		24,00,000	Goods	24,00,000	
To Production Exp.		16,00,000			
To Gross Profit c/d		<u>40,00,000</u>			
		<u>2,08,00,000</u>			<u>2,08,00,000</u>
To Administration Exp.		14,00,000	By Gross Profit b/d		40,00,000
To Selling Exp.		6,00,000			
To Net Profit		<u>20,00,000</u>			
		<u>40,00,000</u>			<u>40,00,000</u>

The opening and closing payables for raw materials were ₹ 16,00,000 and ₹ 19,20,000 respectively whereas the opening and closing balances of receivables were ₹ 12,00,000 and ₹ 16,00,000 respectively.

You are required to ASCERTAIN the working capital requirement by operating cycle method.

(RTP Nov – 2022)

Solution:

Computation of Operating Cycle

(1) Raw Material Storage Period (R)

Raw Material Storage Period (R)

$$= \frac{\text{Average Stock of Raw Material}}{\text{Daily Average Consumption of Raw material}}$$

$$= \frac{(14,40,000 + 16,00,000) / 2}{86,40,000 / 365} = 64.21 \text{ Days}$$

Raw Material Consumed = Opening Stock + Purchases – Closing Stock

$$= ₹ 14,40,000 + ₹ 88,00,000 - ₹ 16,00,000$$

= ₹ 86,40,000

(2) Conversion/Work-in-Process Period (W)

$$\begin{aligned}\text{Conversion/Processing Period} &= \frac{\text{Average Stock of WIP}}{\text{Daily Average Production cost}} \\ &= \frac{(4,80,000 + 8,00,000) / 2}{1,23,20,000 / 365} = 18.96 \text{ days}\end{aligned}$$

Production Cost:

₹

Opening Stock of WIP	4,80,000
Add: Raw Material Consumed	86,40,000
Add: Wages	24,00,000
Add: Production Expenses	<u>16,00,000</u>
	1,31,20,000
Less: Closing Stock of WIP	<u>8,00,000</u>
Production Cost	<u>1,23,20,000</u>

(3) Finished Goods Storage Period (F)

$$\begin{aligned}\text{Conversion/Processing Period} &= \frac{\text{Average Stock of Finished Goods}}{\text{Daily Average Cost of Good Sold}} \\ &= \frac{(20,80,000 + 24,00,000) / 2}{1,20,00,000 / 365} = 68.13 \text{ days}\end{aligned}$$

Cost of Goods Sold

₹

Opening Stock of Finished Goods	20,80,000
Add: Production Cost	<u>1,23,20,000</u>
	<u>1,44,00,000</u>
Less: Closing Stock of Finished Goods	<u>(24,00,000)</u>

1,20,00,000

(4) Receivables Collection Period (D)

$$\begin{aligned}\text{Receivables Collection Period} &= \frac{\text{Average Receivables}}{\text{Daily average credit sales}} \\ &= \frac{(12,00,000 + 16,00,000) / 2}{1,60,00,000 / 365} \\ &= 31.94 \text{ days}\end{aligned}$$

(5) Payables Payment Period (C)

$$\begin{aligned}\text{Payables Payment Period} &= \frac{\text{Average Payables}}{\text{Daily average credit purchase}} \\ &= \frac{(16,00,000 + 19,20,000) / 2}{88,00,000 / 365} = 73 \text{ days}\end{aligned}$$

(6) Duration of Operating Cycle (O)

$$\begin{aligned}O &= R + W + F + D - C \\ &= 64.21 + 18.96 + 68.13 + 31.94 - 73 \\ &= 110.24 \text{ days}\end{aligned}$$

Computation of Working Capital

(i) Number of Operating Cycles per Year

$$= 365 / \text{Duration Operating Cycle} = 365 / 110.24 = 3.311$$

(ii) Total Operating Expenses ₹

Total Cost of Goods sold	1,20,00,000
Add: Administration Expenses	14,00,000
Add: Selling Expenses	<u>6,00,000</u>
	<u>1,40,00,000</u>

(iii) Working Capital Required

$$\begin{aligned}\text{Working Capital Required} &= \frac{\text{Total Operating Expenses}}{\text{Number of Operating Cycles per year}} \\ &= \frac{1,40,00,000}{3.311} = ₹ 42,28,329.81\end{aligned}$$

Question – 28

The following information is provided by MNP Ltd. for the year ending 31st March, 2020:

Raw Material storage period	45 days
Work-in-progress conversion period	20 days
Finished Goods storage period	25 days
Debt collection period	30 days
Creditors payment period	60 days
Annual Operating Cost	₹ 25,00,000

(Including Depreciation of ₹ 25,00,000)

Assume 360 days in a year.

You are required to calculate:

- (i) Operating cycle period
- (ii) Number of operating cycle in a year.
- (iii) Amount of working capital required for the company on a cost basis.
- (iv) The company is market leader in its product and it has no competitor in the market. Based on a market survey it is planning to discontinue sales on credit and deliver products based on pre-payments in order to reduce its working capital requirement substantially. You are required to compute the reduction in working capital requirement in such a scenario.

(Exam, Jan – 2021)

Solution:

(i) Calculation of Operating Cycle Period:

$$\begin{aligned}\text{Operating Cycle Period} &= R + W + F + D - C \\ &= 45 + 20 + 25 + 30 - 60 = \mathbf{60 \text{ days}}\end{aligned}$$

(ii) Number of Operating Cycle in a Year

$$= \frac{360}{\text{Operating cycle period}} = \frac{360}{60} = 6$$

(iii) Amount of Working Capital Required

$$\begin{aligned}\frac{\text{Annual operating cost}}{\text{Number of operating cycle}} &= \frac{\text{₹ } 25,00,000 - \text{₹ } 2,50,000}{6} \\ &= \frac{\text{₹ } 22,50,000}{6} = \mathbf{\text{₹ } 3,75,000}\end{aligned}$$

(iv) Reduction in Working Capital

$$\begin{aligned}\text{Operating Cycle Period} &= R + W + F - C \\ &= 45 + 20 + 25 - 60 = \mathbf{30 \text{ days}}\end{aligned}$$

$$\text{Amount of Working Capital Required} = \frac{\text{₹ } 22,50,000}{360} \times 30 = \text{₹ } 1,87,500$$

$$\begin{aligned}\text{Reduction in Working Capital} &= \text{₹ } 3,75,000 - \text{₹ } 1,87,500 \\ &= \mathbf{\text{₹ } 1,87,500}\end{aligned}$$

Note: If we use Total Cost basis, then amount of Working Capital required will be ₹ 4,16,666.67 (approx.) and Reduction in Working Capital will be ₹ 2,08,333.33 (approx.)

Question – 29

Day Ltd., a newly formed company has applied to the private Bank for the first time for financing its working Capital Requirements. The following information are available about the projections for the current year :

Estimated Level of Activity	Completed Units of Production 31200 plum Unit of Work in Progress 12000
Raw Material Cost	₹ 40 per unit

Direct wages Cost	₹15 per unit
Overhead	₹ 40 per unit (inclusive of depreciation 10 per unit)
Selling price	₹ 130 per unit
Raw Material is Stock	Average 30 days consumption
Work in progress stock	Material 100% and Conversion Cost 50%
Finished Goods Stock	24000 Units
Credit Allowed by the Suppliers	30 days
Credit Allowed to Purchasers	60 days
Direct Wages (Lag in Payment)	15 days
Expected Cash Balance	₹ 2,00,000

Assume that production is carried on evenly throughout the year (360 days) and wages and overheads accrue similarly. All sales are on the credit basis.

You are required to calculate the net working capital requirement on cash cost basis.

(Exam, May – 2018)

Solution:

Calculation of Net Working Capital requirement:

	(₹)	(₹)
A. Current Assets:		
Inventories:		
Stock of Raw material (Refer to Working note (iii))	1,44,000	
Stock of Work in progress (Refer to Working note (ii))	7,50,000	
Stock of Finished goods (Refer to Working note (iv))	20,40,000	
Debtors for Sales (Refer to Working note (v))	1,02,000	
Cash	2,00,000	
Gross Working Capital	32,36,000	32,36,000
B. Current Liabilities:		
Creditors for Purchases (Refer to Working note (vi))	1,56,000	
Creditors for wages (Refer to Working note (vii))	23,250	

	1,79,250	1,79,250
Net Working Capital (A - B)		30,56,750

Working Notes:**(i) Annual cost of production**

	(₹)
Raw material requirements {(31,200 × ₹ 40) + (12,000 × ₹ 40)}	17,28,000
Direct wages {(31,200 × ₹ 15) + (12,000 × ₹ 15 × 0.5)}	5,58,000
Overheads (exclusive of depreciation) {(31,200 × ₹ 30) + (12,000 × ₹ 30 × 0.5)}	11,16,000
Gross Factory Cost	34,02,000
Less: Closing W.I.P [12,000 (₹ 40 + ₹ 7.5 + ₹ 15)]	(7,50,000)
Cost of Goods Produced	26,52,000
Less: Closing Stock of Finished Goods (₹ 26,52,000 × 24,000/31,200)	(20,40,000)
Total Cash Cost of Sales	6,12,000

(ii) Work in progress stock

	(₹)
Raw material requirements (12,000 units × ₹40)	4,80,000
Direct wages (50% × 12,000 units × ₹ 15)	90,000
Overheads (50% × 12,000 units × ₹ 30)	1,80,000
	7,50,000

(iii) Raw material stock

It is given that raw material in stock is average 30 days consumption. Since, the company is newly formed; the raw material requirement for production and work in progress will be issued and consumed during the year. Hence, the raw material consumption for the year (360 days) is as follows:

	(₹)
For Finished goods (31,200 × ₹ 40)	12,48,000
For Work in progress (12,000 × ₹ 40)	4,80,000
	17,28,000

$$\text{Raw material stock} = \frac{\text{₹ } 17,28,000}{360 \text{ days}} \times 30 \text{ days} = \text{₹ } 1,44,000$$

(iv) Finished goods stock:

24,000 units @ ₹ (40+15+30) per unit = ₹ 20,40,000

(v) Debtors for sale: $6,12,000 \times \frac{60 \text{ days}}{360 \text{ days}} = ₹ 1,02,000$

(vi) Creditors for raw material Purchases [Working Note (iii)]:

Annual Material Consumed (₹ 12,48,000 + ₹ 4,80,000) ₹ 17,28,000

Add: Closing stock of raw material ₹ 1,44,000

₹ 18,72,000

Credit allowed by suppliers = $\frac{₹ 18,72,000}{360 \text{ days}} \times 30 \text{ days} = ₹ 1,56,000$

(vii) Creditors for wages:

Outstanding wage payment = $\frac{₹ 5,58,000}{360 \text{ days}} \times 15 \text{ days} = ₹ 23,250$

Question – 30

Bitra Limited manufactures used in the steel industry. The following information regarding the company is given for your consideration :

- (i) Expected level of production 9000 units per annum.
- (ii) Raw materials are expected to remain in store for an average of two months before issue to production.
- (iii) Work-in progress (50 percent complete as to conversion cost) will approximate to ½ month's production.
- (iv) Finished goods remain in warehouse on an average for one month.
- (v) Credit allowed by suppliers is one month.
- (vi) Two month's credit is normally allowed to debtors.
- (vii) A minimum cash balance of ₹ 67,500 is expected to be maintained.
- (viii) Cash sales are 75 percent less than the credit sales.
- (ix) Safety margin of 20 percent to cover unforeseen contingencies.

- (x) The production pattern is assumed to be even during the year.
- (xi) The cost structure for Bita Limited's product is as follows:

	₹
Raw Materials	80 per unit
Direct Labour	20 per unit
Overheads (including depreciation)	<u>80</u> per unit
Total Cost	<u>180</u> per unit
Profit	20 per unit
Selling Price	<u>200</u> per unit

You are required to estimate the working capital requirement of Bita limited.

(Exam, May – 2019)

Solution:

Statement showing Estimate of Working Capital Requirement

	(Amount in ₹)	(Amount in ₹)
A. Current Assets		
(i) Inventories:		
- Raw material inventory $\left(\frac{9,000 \text{ unit} \times ₹ 80}{12 \text{ months}} \times 2 \text{ months} \right)$		1,20,000
- Work in Progress:		
Raw material $\left(\frac{9,000 \text{ unit} \times ₹ 80}{12 \text{ months}} \times 0.5 \text{ months} \right)$	30,000	
Wages $\left(\frac{9,000 \text{ unit} \times ₹ 20}{12 \text{ months}} \times 0.5 \text{ months} \right) \times 50\%$	3,750	
Overheads $\left(\frac{9,000 \text{ unit} \times ₹ 60}{12 \text{ months}} \times 0.5 \text{ months} \right) \times 50\%$ (Other than Depreciation)	11,250	45,000
Finished goods (inventory held for 1		1,20,000

	months) $\left(\frac{9,000 \text{ unit} \times ₹ 160}{12 \text{ months}} \times 1 \text{ months} \right)$	
(ii)	Debtors (for 2 months) $\left(\frac{9,000 \text{ unit} \times ₹ 160}{12 \text{ months}} \times 2 \text{ months} \right) \times 80\%$ or $\left(\frac{11,52,000}{12 \text{ months}} \times 2 \text{ months} \right)$	1,92,000
(iii)	Cash balance expected	67,500
	Total Current assets	5,44,500
B. Current Liabilities		
(i)	Creditors for Raw material (1month) $\left(\frac{9,000 \text{ unit} \times ₹ 80}{12 \text{ months}} \times 1 \text{ months} \right)$	60,000
	Total current liabilities	60,000
	Net working capital (A – B)	4,84,500
	Add: Safety margin of 20 percent	96,900
	Working capital Requirement	5,81,400

Working Notes:

1. If Credit sales is x then cash sales is x-75% of x i.e. x/4.

$$\text{Or } x + 0.25x = ₹ 18,00,000$$

$$\text{Or } x = ₹ 14,40,000$$

So, credit Sales is ₹ 14,40,000

$$\text{Hence, Cash cost of credit sales } \left(\frac{₹ 14,40,000}{5} \times 4 \right) = ₹ 11,52,000$$

2. It is assumed that safety margin of 20% is on net working capital.
3. No information is given regarding lag in payment of wages, hence ignored assuming it is paid regularly.
4. Debtors/Receivables is calculated based on total cost.

[If Debtors/Receivables is calculated based on sales, then debtors will be

$$\left(\frac{9,000 \text{ unit} \times ₹ 200}{12 \text{ months}} \times 2 \text{ months} \right) \times 80\% \text{ or } \left(\frac{₹ 14,40,000}{12 \text{ months}} \times 2 \text{ months} \right)$$

= ₹ 2,40,000

Then Total Current assets will be ₹ 5,92,500 and accordingly Net working capital and Working capital requirement will be ₹ 5,32,500 and ₹ 6,39,000 respectively].

Question – 31

Balance sheet of X Ltd for the year ended 31st March, 2022 is given below :

Liabilities	Amount	Assets	Amount
Equity shares ₹ 10 each	200	Fixed Assets	500
Retained earnings	200	Raw materials	150
11% Debentures	300	W.I.P	100
Public deposits (short-Term)	100	Finished goods	50
Trade Creditors	80	Debtors	125
Bill payable	100	Cash/Back	55
	980		980

Calculate the amount of maximum permissible bank finance under three methods as per Tandon Committee lending norms.

The total core current assets are assumed to be ₹ 30 lakhs.

(Exam, May – 2022)

Solution:

Current Assets = 150 + 100 + 50 + 125 + 55 = ₹ 480 Lakhs

Current Liabilities = 100 + 80 + 100 = ₹ 280 Lakhs

Maximum Permissible Bank Finance under Tandon Committee Norms:

Method I

Maximum Permissible Bank Finance

= 75% of (Current Assets – Current Liabilities)

= 75% of (480 – 280)

= 150 Lakhs

Method II

Maximum Permissible Bank Finance

= 75% of Current Assets – Current Liabilities

= 75 % of 480 – 280

= 80 Lakhs

Method III

Maximum Permissible Bank Finance

= 75% of (Current Assets – Core Current Assets) – Current Liabilities

= 75 % of (480 - 30) – 280

= 57.5 Lakhs

Question – 32

PK Ltd., a manufacturing company, provides the following information:

	(₹)
Sales	1,08,00,000
Raw Material Consumed	27,00,000
Labour Paid	21,60,000
Manufacturing Overhead	32,40,000
(Including Depreciation for the year ₹ 3,60,000)	
Administrative & Selling Overhead	10,80,000

Additional Information:

- (a) Receivables are allowed 3 month's credit.
- (b) Raw material supplier extends 3 month's credit.
- (c) Lag in payment of Labour is 1 month.
- (d) Manufacturing overhead are paid one month in arrear.
- (e) Administrative & Selling Overhead is paid one month advance.
- (f) Inventory holding period of Raw Material & Finished Goods are of 3 months.
- (g) Work-in-Progress is Nil.

(h) PK Ltd. sells goods at Cost plus $33\frac{1}{3}\%$.

(i) Cash balance ₹ 3,00,000.

(j) Safety Margin 10%.

You are required to compute the Working Capital Requirements of PK Ltd. on Cash Cost basis.

(Exam Nov – 2020)

Solution:

Statement showing the requirements of Working Capital (Cash Cost basis)

Particulars	(₹)	(₹)
A. Current Assets:		
Inventory:		
Stock of Raw material (₹ 27,00,000 × 3/12)	6,75,000	
Stock of Finished goods (₹ 77,40,000 × 3/12)	19,35,000	
Receivables (₹ 88,20,000 × 3/12)	22,05,000	
Administrative and Selling Overhead (₹ 10,80,000 × 1/12)	90,000	
Cash in Hand	3,00,000	
Gross Working Capital	52,05,000	52,05,000
B. Current Liabilities:		
Payables for Raw materials* (₹ 27,00,000 × 3/12)	6,75,000	
Outstanding Expenses:		
Wages Expenses (₹ 21,60,000 × 1/12)	1,80,000	
Manufacturing Overhead (₹ 28,80,000 × 1/12)	2,40,000	
Total Current Liabilities		
Net Working Capital (A-B)	10,95,000	10,95,000
Add: Safety margin @ 10%		41,10,000
Total Working Capital requirements		4,11,000

45,21,000

Working Notes:

(i)

(A) Computation of Annual Cash Cost of Production	(₹)
Raw Material consumed	27,00,000
Wages (Labour paid)	21,60,000
Manufacturing overhead (₹ 32,40,000 - ₹ 3,60,000)	28,80,000
Total cash cost of production	77,40,000
(B) Computation of Annual Cash Cost of Sales	(₹)
Cash cost of production as in (A) above	77,40,000
Administrative & Selling overhead	10,80,000
Total cash cost of sales	88,20,000

*Purchase of Raw material can also be calculated by adjusting Closing Stock and Opening Stock (assumed nil). In that case Purchase will be Raw material consumed + Closing Stock - Opening Stock i.e ₹ 27,00,000 + ₹ 6,75,000 - Nil = ₹ 33,75,000. Accordingly, Total Working Capital requirements (₹ 43,35,375) can be calculated.

Question – 33

X Ltd. has furnished following cost sheet of per unit cost;

Raw material cost	₹ 150
Direct labour cost	₹ 40
Overhead cost	₹ 60
Total Cost	₹ 250
Profit	₹ 50
Selling Price	₹ 300

The company keeps raw material in stock on an average for 2 months; work in progress on an average for 3 months and finished goods in stock on an average 1 month. The credit allowed by suppliers is 1.5 months and company allows 2 months credit to its debtors. The lag in payment of wages is 1 month and lag in payment of overhead expenses is 1.5 months. The company sells 25% of the output against cash and maintain cash in hand at bank put together at ₹

1,50,000. Production is carried on evenly throughout the year and wages and overheads also similarly. Work in progress stock is 75% complete in all respects. Prepare statement showing estimate of working capital requirements to finance an activity level of 15,000 units of production.

(Exam, Nov – 2023)

Solution:

Statement showing Estimate of Working Capital Needs

(Receivables (Debtors) are calculated based on Cost of goods sold)

		(₹)	(₹)
A.	Current Assets		
(i)	Inventories:		
	Raw material (2 months) $\left(\frac{15,000 \text{ units} \times ₹ 150}{12 \text{ months}} \times 2 \text{ months} \right)$	3,75,000	
	WIP Inventory (3 months) $\left(\frac{15,000 \text{ units} \times ₹ 250}{12 \text{ months}} \times 3 \text{ months} \right) \times 0.75$	7,03,125	
	Finished goods inventory (1 months) $\left(\frac{15,000 \text{ units} \times ₹ 250}{12 \text{ months}} \times 1 \text{ months} \right)$	3,12,500	13,90,625
(ii)	Receivables (Debtors) (2 months) $\left(\frac{15,000 \text{ units} \times ₹ 250}{12 \text{ months}} \times 2 \text{ months} \right) \times 0.75$		4,68,750
(iii)	Cash and bank balance		1,50,000
	Total Current Assets		20,09,375
B.	Current Liabilities:		
(i)	Payables (Creditors) for materials (1.5 months) $\left(\frac{15,000 \text{ units} \times ₹ 150}{12 \text{ months}} \times 1.5 \text{ months} \right) \times 0.75$		2,81,250
(ii)	Outstanding wages (1 months) $\left(\frac{15,000 \text{ units} \times ₹ 40}{12 \text{ months}} \times 1 \text{ months} \right)$		50,000
(iii)	Outstanding overheads (1.5 months) $\left(\frac{15,000 \text{ units} \times ₹ 60}{12 \text{ months}} \times 1.5 \text{ months} \right)$		1,12,500
	Total Current Liabilities		4,43,750
	Net Working Capital Needs (A – B)		15,65,625

Alternative Solution**Statement showing Estimate of Working Capital Needs****(Receivables (Debtors) are calculated based on Selling price)**

		(₹)	(₹)
A.	Current Assets		
(i)	Inventories:		
	Raw material (2 months) $\left(\frac{15,000 \text{ units} \times ₹ 150}{12 \text{ months}} \times 2 \text{ months} \right)$	3,75,000	
	WIP Inventory (3 months) $\left(\frac{15,000 \text{ units} \times ₹ 250}{12 \text{ months}} \times 3 \text{ months} \right) \times 0.75$	7,03,125	
	Finished goods inventory (1 months) $\left(\frac{15,000 \text{ units} \times ₹ 250}{12 \text{ months}} \times 1 \text{ months} \right)$	3,12,500	13,90,625
(ii)	Receivables (Debtors) (2 months) $\left(\frac{15,000 \text{ units} \times ₹ 300}{12 \text{ months}} \times 2 \text{ months} \right) \times 0.75$		5,62,500
(iii)	Cash and bank balance		1,50,000
	Total Current Assets		21,03,125
B.	Current Liabilities:		
(i)	Payables (Creditors) for materials (1.5 months) $\left(\frac{15,000 \text{ units} \times ₹ 150}{12 \text{ months}} \times 1.5 \text{ months} \right)$		2,81,250
(ii)	Outstanding wages (1 months) $\left(\frac{15,000 \text{ units} \times ₹ 40}{12 \text{ months}} \times 1 \text{ months} \right)$		50,000
(iii)	Outstanding overheads (1.5 months) $\left(\frac{15,000 \text{ units} \times ₹ 60}{12 \text{ months}} \times 1.5 \text{ months} \right)$		1,12,500
	Total Current Liabilities		4,43,750
	Net Working Capital Needs (A – B)		16,59,375

(2) DEBTORS MANAGEMENT**Question – 34**

The following information is available in respect of Sai trading company:

- (i) On an average, debtors are collected after 45 days; inventories have an average holding period of 75 days and creditor's payment period on an average is 30 days.
- (ii) The firm spends a total of ₹ 120 lakhs annually at a constant rate.
- (iii) It can earn 10 per cent on investments.

From the above information, you are required to CALCULATE:

- (a) The cash cycle and cash turnover,
- (b) Minimum amounts of cash to be maintained to meet payments as they become due,
- (c) Savings by reducing the average inventory holding period by 30 days.

(Study Material ICAI Illus – 11)

Solution:

- (a) Cash cycle = 45 days + 75 days – 30 days = 90 days (3 months)
Cash turnover = 12 months (360 days)/3 months (90 days) = 4.
- (b) Minimum operating cash = Total operating annual outlay/cash turnover,
that is, ₹ 120 lakhs/4 = ₹ 30 lakhs.
- (c) Cash cycle = 45 days + 45 days – 30 days = 60 days (2 months).
Cash turnover = 12 months (360 days)/2 months (60 days) = 6.
Minimum operating cash = ₹ 120 lakhs/6 = ₹ 20 lakhs.
Reduction in investments = ₹ 30 lakhs – ₹ 20 lakhs = ₹ 10 lakhs.
Savings = $0.10 \times ₹ 10 \text{ lakhs} = ₹ 1 \text{ lakh}$.

Question – 35

A trader whose current sales are in the region of ₹ 6 lakhs per annum and an average collection period of 30 days wants to pursue a more liberal policy to improve sales. A study made by a management consultant reveals the following information:-

Credit Policy	Increase in collection period	Increase in sales	Present default anticipated
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A	10 days	₹ 30,000	1.5%
B	20 days	₹ 48,000	2%
C	30 days	₹ 75,000	3%
D	40 days	₹ 90,000	4%

The selling price per unit is ₹ 3. Average cost per unit is 2.25 and variable costs per unit are ₹ 2. The current bad debt loss is 1%. Required return on additional investment is 20%. Assume a 360 days year.

Which of the above policies would you recommend for adoption?

(Study Material ICAI Illus – 12)

Solution:

A. Statement showing the Evaluation of Debtors Policies (Total Approach)

Particulars	Present Policy 30 days	Proposed Policy A 40 days	Proposed Policy B 50 days	Proposed Policy C 60 days	Proposed Policy D 75 days
	₹	₹	₹	₹	₹
A. Expected Profit:					
(a) Credit Sales	6,00,000	6,30,000	6,48,000	6,75,000	6,90,000
(b) Total Cost other than Bad Debts					
(i) Variable Cost [Sales × 2/3]	4,00,000	4,20,000	4,32,000	4,50,000	4,60,000
(ii) Fixed Costs	50,000	50,000	50,000	50,000	50,000
	4,50,000	4,70,000	4,82,000	5,00,000	5,10,000
(c) Bad Debts	6,000	9,450	12,960	20,250	27,600
(d) Expected Profit [(a) – (b) – (c)]	1,44,000	1,50,550	1,53,040	1,54,750	1,52,400
B. Opportunity Cost of Investments in Receivables	7,500	10,444	13,389	16,667	21,250
C. Net Benefits (A – B)	1,36,500	1,40,106	1,39,651	1,38,083	1,31,150

Recommendation: The Proposed Policy A (i.e. increase in collection period by 10 days or total 40 days) should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Notes:

(i) Calculation of Fixed Cost

$$\begin{aligned}
 &= [\text{Average Cost per unit} - \text{Variable Cost per unit}] \times \text{No. of Units sold} \\
 &= [₹ 2.25 - ₹ 2.00] \times (₹ 6,00,000/3) \\
 &= ₹ 0.25 \times 2,00,000 = ₹ 50,000
 \end{aligned}$$

(ii) Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection Period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$\text{Present Policy} = 4,50,000 \times \frac{30}{360} \times \frac{20}{100} = 7,500$$

$$\text{Policy A} = 4,70,000 \times \frac{40}{360} \times \frac{20}{100} = 10,444$$

$$\text{Policy B} = 4,82,000 \times \frac{50}{360} \times \frac{20}{100} = 13,389$$

$$\text{Policy C} = 5,00,000 \times \frac{60}{360} \times \frac{20}{100} = 16,667$$

$$\text{Policy D} = 5,10,000 \times \frac{75}{360} \times \frac{20}{100} = 21,250$$

B. Another method of solving the problem is Incremental Approach. Here we assume that sales are all credit sales.

Particulars		Present Policy 30 days	Proposed Policy A 40 days	Proposed Policy B 50 days	Proposed Policy C 60 days	Proposed Policy D 75 days
		₹	₹	₹	₹	₹
A.	Incremental Expected Profit:					
	(a) Incremental Credit Sales	---	30,000	48,000	75,000	90,000
	(b) Incremental Costs					
	(i) Variable Costs	---	20,000	32,000	50,000	60,000
	(ii) Fixed Costs	---	-	-	-	-
	(c) Incremental Bad Debt Losses	---	3,450	6,960	14,250	21,600

	(d) Incremental Expected Profit (a – b – c)]		6,550	9,040	10,750	8,400
B.	Required Return on Incremental Investments:					
	(a) Cost of Credit Sales	4,50,000	4,70,000	4,82,000	5,00,000	5,10,000
	(b) Collection period	30	40	50	60	75
	(c) Investment in Receivable (a × b/360)	37,500	52,222	66,944	83,333	1,06,250
	(d) Incremental Investment in Receivables	---	14,722	29,444	45,833	68,750
	(e) Required Rate of Return (in %)		20	20	20	20
	(f) Required Return on Incremental Investments (d × e)	---	2,944	5,889	9,167	13,750
C.	Net Benefits (A – B)	---	3,606	3,151	1,583	- 5,350

Recommendation: The Proposed Policy A should be adopted since the net benefits under this policy are higher than those under other policies.

C. Another method of solving the problem is by computing the **Expected Rate of Return**.

$$\text{Expected Rate of Return} = \frac{\text{Incremental Expected Profit}}{\text{Incremental Investment in Receivables}} \times 100$$

$$\text{For Policy A} = \frac{₹ 6,550}{₹ 14,722} \times 100 = 44.49\%$$

$$\text{For Policy B} = \frac{₹ 9,040}{₹ 29,444} \times 100 = 30.70\%$$

$$\text{For Policy C} = \frac{₹ 10,750}{₹ 45,833} \times 100 = 23.45\%$$

$$\text{For Policy D} = \frac{₹ 8,440}{₹ 68,750} \times 100 = 12.22\%$$

Recommendation: The Proposed Policy A should be adopted since the Expected Rate of Return (44.49%) is more than the Required Rate of Return (20%) and is highest among the given policies compared.

Question – 36

XYZ Corporation is considering relaxing its present credit policy and is in the process of evaluating two proposed policies. Currently, the firm has annual credit sales of ₹ 50 lakhs and accounts receivable turnover ratio of 4 times a year. The current level of loss due to bad debts is ₹ 1,50,000. The firm is required to give a return of 25% on the investment in new accounts receivables. The company's variable costs are 70% of the selling price. Given the following information, which is the better option?

	Present Policy	Policy Option I	Policy Option II
Annual credit sales	50,00,000	60,00,000	67,50,000
Accounts receivable turnover ratio	4 times	3 times	2.4 times
Bad debt losses	1,50,000	3,00,000	4,50,000
Bad debt losses	1,50,000	3,00,000	4,50,000

(Study Material ICAI Illus – 13)

Solution:

Statement showing the Evaluation of Debtors Policies

Particulars	Present Policy	Proposed Policy I	Proposed Policy II
	₹	₹	₹
A Expected Profit:			
(a) Credit Sales	50,00,000	60,00,000	67,50,000
(b) Total Cost other than Bad Debts:			
(i) Variable Costs	35,00,000	42,00,000	47,25,000
(c) Bad Debts	1,50,000	3,00,000	4,50,000
(d) Expected Profit [(a) – (b) – (c)]	13,50,000	15,00,000	15,75,000
B Opportunity Cost of Investments in Receivables	2,18,750	3,50,000	4,92,188
C Net Benefits (A – B)	11,31,250	11,50,000	10,82,812

Recommendation: The Proposed Policy I should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection Period}}{12} \times \frac{\text{Rate of Return}}{100}$$

Collection Period in months = 12 / Accounts Receivable Turnover Ratio

$$\text{Present Policy} = ₹ 35,00,000 \times 3/12 \times 25\% = ₹ 2,18,750$$

$$\text{Proposed Policy I} = ₹ 42,00,000 \times 4/12 \times 25\% = ₹ 3,50,000$$

$$\text{Proposed Policy II} = ₹ 47,25,000 \times 5/12 \times 25\% = ₹ 4,92,188$$

Question – 37

A company is presently having credit sales of ₹ 12 lakh. The existing credit terms are 1/10, net 45 days and average collection period is 30 days. The current bad debts loss is 1.5%. In order to accelerate the collection process further as also to increase sales, the company is contemplating liberalization of its existing credit terms to 2/10, net 45 days. It is expected that sales are likely to increase by 1/3 of existing sales, bad debts increase to 2% of sales and average collection period to decline to 20 days. The contribution to sales ratio of the company is 22% and opportunity cost of investment in receivables is 15 percent (pre-tax). 50 per cent and 80 percent of customers in terms of sales revenue are expected to avail cash discount under existing and liberalization scheme respectively. The tax rate is 30%.

ADVISE, should the company change its credit terms? (Assume 360 days in a year).

(Study Material ICAI Illus – 14)

Solution:

Working Notes:

(i) Calculation of Cash Discount

$$\text{Cash Discount} = \text{Total credit sales} \times \% \text{ of customers who take up discount} \times \text{Rate}$$

$$\text{Present Policy} = \frac{12,00,000 \times 50 \times .01}{100} = ₹ 6,000$$

$$\text{Proposed Policy} = 16,00,000 \times 0.80 \times 0.02 = ₹ 25,600$$

(ii) Opportunity Cost of Investment in Receivables

Present Policy = $9,36,000 \times (30/360) \times (70\% \text{ of } 15)/100 = 78,000 \times 10.5/100 = ₹ 8,190$

Proposed Policy = $12,48,000 \times (20/360) \times 10.50/100 = ₹ 7,280$

Statement showing Evaluation of Credit Policies

Particulars	Present Policy	Proposed Policy
Credit Sales	12,00,000	16,00,000
Variable Cost @ 78%* of sales	9,36,000	12,48,000
Bad Debts @ 1.5% and 2%	18,000	32,000
Cash Discount	6,000	25,600
Profit before tax	2,40,000	2,94,400
Tax @ 30%	72,000	88,320
Profit after Tax	1,68,000	2,06,080
Opportunity Cost of Investment in Receivables	8,190	7,280
Net Profit	1,59,810	1,98,800

*Only relevant or variable costs are considered for calculating the opportunity costs on the funds blocked in receivables. Since 22% is contribution, hence the relevant costs are taken to be 78% of the respective sales.

Advise: Proposed policy should be adopted since the net benefit is increased by $(₹1,98,800 - ₹1,59,810) ₹ 38,990$.

Question – 38

Mosaic Limited has current sales of ₹ 15 lakhs per year. Cost of sales is 75 per cent of sales and bad debts are one per cent of sales. Cost of sales comprises 80 per cent variable costs and 20 per cent fixed costs, while the company's required rate of return is 12 per cent. Mosaic Limited currently allows customers 30 days' credit, but is considering increasing this to 60 days' credit in order to increase sales.

It has been estimated that this change in policy will increase sales by 15 per cent, while bad debts will increase from one per cent to four per cent. It is not expected that the policy change will result in an increase in fixed costs and creditors and stock will be unchanged.

Should Mosaic Limited introduce the proposed policy? (Assume a 360 days year)

(Study Material ICAI Illus – 16)

Solution:

New level of sales will be $15,00,000 \times 1.15 = ₹ 17,25,000$

Variable costs are $80\% \times 75\% = 60\%$ of sales

Contribution from sales is therefore 40% of sales

Fixed Cost are $20\% \times 75\% = 15\%$ of sales

Particulars	₹	₹
Proposed investment in debtors = Variable Cost + Fixed Cost * = $(17,25,000 \times 60\%) + (15,00,000 \times 15\%)$ = $(10,35,000 + 2,25,000) \times \frac{60}{360}$		2,10,000
Current investment in debtors = $[(15,00,000 \times 60\%) + (15,00,000 \times 15\%)] \times \frac{30}{360}$		93,750
Increase in investment in debtors		1,16,250
Increase in contribution = $15\% \times 15,00,000 \times 40\%$		90,000
New level of bad debts = $(17,25,000 \times 4\%)$	69,000	
Current level of bad debts = $(15,00,000 \times 1\%)$	15,000	
Increase in bad debts		(54,000)
Additional financing costs = $1,16,250 \times 12\% =$		(13,950)
Savings by introducing change in policy		22,050

*Fixed cost is taken at existing level in case of proposed investment as well

Advise: Mosaic Limited should introduce the proposed policy.

Question – 39

PQR Ltd. having an annual sales of ₹ 30 lakhs, is re-considering its present collection policy. At present, the average collection period is 50 days and the

bad debt losses are 5% of sales. The company is incurring an expenditure of ₹ 30,000 on account of collection of receivables. Cost of funds is 10 percent.

The alternative policies are as under:

	Alternative I	Alternative II
Average Collection Period	40 days	30 days
Bad Debt Losses	4% of sales	3% of sales
Collection Expenses	₹ 60,000	₹ 95,000

DETERMINE the alternatives on the basis of incremental approach and state which alternative is more beneficial.

(Study Material ICAI TYK – 11)

Solution:

Evaluation of Alternative Collection Programmes

	Present Policy	Alternative I	Alternative II
	₹	₹	₹
Sales Revenues	30,00,000	30,00,000	30,00,000
Average Collection Period (ACP) (days)	50	40	30
Receivables (₹) $\left(\text{Sales} \times \frac{\text{ACP}}{360} \right)$	4,16,667	3,33,333	2,50,000
Reduction in Receivables from Present Level (₹)	-	83,334	1,66,667
Savings in Interest @ 10% p.a. (A)	-	₹ 8,333	₹ 16,667
% of Bad Debt Loss	5%	4%	3%
Amount (₹)	1,50,000	1,20,000	90,000
Reduction in Bad Debts from Present Level (B)	-	30,000	60,000
Incremental Benefits from Present Level (C) = (A) + (B)	-	38,333	76,667
Collection Expenses (₹)	30,000	60,000	95,000
Incremental Collection Expenses from Present Level (D)	-	30,000	65,000
Incremental Net Benefit (C – D)	-	₹ 8,333	₹ 11,667

Conclusion: From the analysis it is apparent that Alternative I has a benefit of ₹ 8,333 and Alternative II has a benefit of ₹ 11,667 over present level.

Alternative II has a benefit of ₹ 3,334 more than Alternative I. Hence Alternative II is more viable.

(**Note:** In absence of Cost of Sales, sales has been taken for purpose of calculating investment in receivables. 1 year = 360 days.)

Question – 40

As a part of the strategy to increase sales and profits, the sales manager of a company proposes to sell goods to a group of new customers with 10% risk of non-payment. This group would require one and a half months credit and is likely to increase sales by ₹ 1,00,000 p.a. Production and Selling expenses amount to 80% of sales and the income-tax rate is 50%. The company's minimum required rate of return (after tax) is 25%.

Should the sales manager's proposal be accepted? ANALYSE

Also COMPUTE the degree of risk of non-payment that the company should be willing to assume if the required rate of return (after tax) were (i) 30%, (ii) 40% and (iii) 60%.

(Study Material ICAI TYK – 12)

Solution:

Statement showing the Evaluation of Proposal

Particulars	₹
A. Expected Profit:	
Net Sales	1,00,000
Less: Production and Selling Expenses @ 80%	(80,000)
Profit before providing for Bad Debts	20,000
Less: Bad Debts @10%	(10,000)
Profit before Tax	10,000
Less: Tax @ 50%	(5,000)
Profit after Tax	5,000
B. Opportunity Cost of Investment in Receivables	(2,500)
C. Net Benefits (A – B)	2,500

Advise: The sales manager's proposal should be accepted.

Working Note: Calculation of Opportunity Cost of Funds

Opportunity Cost

$$= \text{Total Cost of Credit Sales} \times \frac{\text{Collection Period}}{12} \times \frac{\text{Required Rate of Return}}{100}$$

$$= ₹ 80,000 \times \frac{1.5}{12} \times \frac{25}{100} = ₹ 2,500$$

Statement showing the Acceptable Degree of Risk of Non-payment

Particulars	Required Rate of Return		
	30%	40%	60%
Sales	1,00,000	1,00,000	1,00,000
Less: Production and Sales Expenses	80,000	80,000	80,000
Profit before providing for Bad Debts	20,000	20,000	20,000
Less: Bad Debts (assume X)	X	X	X
Profit before tax	20,000 – X	20,000 – X	20,000 – X
Less: Tax @ 50%	(20,000 – X) 0.5	(20,000 – X) 0.5	(20,000 – X) 0.5
Profit after Tax	10,000 – 0.5X	10,000 – 0.5X	10,000 – 0.5X
Required Return (given)	30% of 10,000*	40% of 10,000*	60% of 10,000*
	= ₹ 3,000	= ₹ 4,000	= ₹ 6,000

$$*\text{Average Debtors} = \text{Total Cost of Credit Sales} \times \frac{\text{Collection Period}}{12}$$

$$= ₹ 80,000 \times \frac{1.5}{12} = ₹ 10,000$$

Computation of the value and percentage of X in each case is as follows:

Case I

$$10,000 - 0.5x = 3,000$$

$$0.5x = 7,000$$

$$X = 7,000 / 0.5 = ₹ 14,000$$

$$\text{Bad Debts as \% of sales} = ₹ 14,000 / ₹ 1,00,000 \times 100 = 14\%$$

Case II

$$10,000 - 0.5x = 4,000$$

$$0.5x = 6,000$$

$$X = 6,000 / 0.5 = ₹ 12,000$$

Bad Debts as % of sales $= ₹ 12,000 / ₹ 1,00,000 \times 100 = 12\%$

Case III $10,000 - 0.5x = 6,000$

$0.5x = 4,000$

$X = 4,000 / 0.5 = ₹ 8,000$

Bad Debts as % of sales $= ₹ 8,000 / ₹ 1,00,000 \times 100 = 8\%$

Thus, it is found that the Acceptable Degree of risk of non-payment is 14%, 12% and 8% if required rate of return (after tax) is 30%, 40% and 60% respectively.

Question – 41

Slow Payers are regular customers of Goods Dealers Ltd. and have approached the sellers for extension of credit facility for enabling them to purchase goods. On an analysis of past performance and on the basis of information supplied, the following pattern of payment schedule emerges in regard to Slow Payers:

Pattern of Payment Schedule	
At the end of 30 days	15% of the bill
At the end of 60 days	34% of the bill
At the end of 90 days	30% of the bill
At the end of 100 days	20% of the bill
Non-recovery	1% of the bill

Slow Payers want to enter into a firm commitment for purchase of goods of ₹ 15 lakhs in 2021-22, deliveries to be made in equal quantities on the first day of each quarter in the calendar year. The price per unit of commodity is ₹ 150 on which a profit of ₹ 5 per unit is expected to be made. It is anticipated by Goods Dealers Ltd., that taking up of this contract would mean an extra recurring expenditure of ₹ 5,000 per annum. If the opportunity cost of funds in the hands of Goods Dealers is 24% per annum, would you as the finance manager of the seller recommend the grant of credit to Slow Payers? ANALYSE. Workings should form part of your answer. Assume year of 365 days.

(Study Material ICAI TYK – 13)

Solution:

Statement showing the Evaluation of Debtors Policies

Particulars	Proposed Policy ₹
A. Expected Profit:	
(a) Credit Sales	15,00,000
(b) Total Cost	
(i) Variable Cost	14,50,000
(ii) Recurring Costs	5,000
	14,55,000
(c) Bad Debts	15,000
(d) Expected Profit [(a) – (b) – (c)]	30,000
B. Opportunity Cost of Investment in Receivables	68,787
C. Net Benefits (A – B)	(38,787)

Recommendation: The Proposed Policy should not be adopted since the net benefits under this policy are negative

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection Period}}{365} \times \frac{\text{Rate of Return}}{100}$$

Particulars	15%	34%	30%	20%	Total
A. Total Cost	2,18,250	4,94,700	4,36,500	2,91,000	14,40,450
B. Collection Period	30/365	60/365	90/365	100/365	
C. Required Rate of Return	24%	24%	24%	24%	
D. Opportunity Cost (A×B×C)	4,305	19,517	25,831	19,134	68,787

Question – 42

Avesh Pvt. Ltd. is considering relaxing its present credit policy for accounts receivable and is in the process of evaluating two proposed policies. Currently, the company has annual credit sales of ₹ 55 lakhs and accounts receivable turnover ratio of 5 times a year. The current level of loss due to bad debts is ₹ 2,00,000. The company is required to give a return of 15% on the investment in new accounts receivable. The company's variable costs are 75% of the selling price. Given the following information, IDENTIFY which is the better policy?

(Amount in ₹)

Particular	Present Policy	Proposed Policy - 1	Proposed Policy - 2
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Annual credit sales	55,00,000	65,00,000	70,00,000
Account receivable turnover ratio	5 times	3 times	4 times
Bad debt losses	2,00,000	3,50,000	5,00,000

(MTP October – 2022)

Solution:**Statement showing the Evaluation of Accounts Receivable Policies**

(Amount in ₹)

	Particulars	Present Policy	Present Policy 1	Present Policy 2
A	Expected Profit:			
	(a) Credit Sales	55,00,000	65,00,000	70,00,000
	(b) Total Cost other than Bad Debts:			
	(i) Variable Costs (75%)	41,25,000	48,75,000	52,50,000
	(c) Bad Debts	2,00,000	3,50,000	5,00,000
	(d) Expected Profit [(a) (b) (c)]	11,75,000	12,75,000	12,50,000
B	Opportunity Cost of Investments in Accounts Receivable (Working Note)	1,23,750	1,82,813	2,62,500
C	Net Benefits (A – B)	10,51,250	10,92,187	9,87,500

Recommendation: The Proposed Policy 1 should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Note:

Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \text{Collection period}/12 \times \text{Rate of Return}/100$$

$$\text{Present Policy} = ₹ 41,25,000 \times 2.4/12 \times 15\% = ₹ 1,23,750$$

$$\text{Proposed Policy 1} = ₹ 48,75,000 \times 3/12 \times 15\% = ₹ 1,82,813$$

$$\text{Proposed Policy 2} = ₹ 52,50,000 \times 4/12 \times 15\% = ₹ 2,62,500$$

Question – 43

A Ltd. is in the manufacturing business and it acquires raw material from X Ltd. on a regular basis. As per the terms of agreement the payment must be made within 40 days of purchase. However, A Ltd. has a choice of paying ₹ 98.50 per ₹ 100 it owes to X Ltd. on or before 10th day of purchase.

Required:

EXAMINE whether A Ltd. should accept the offer of discount assuming average billing of A Ltd. with X Ltd. is ₹ 10,00,000 and an alternative investment yield a return of 15% and company pays the invoice.

(RTP May – 2018)

Solution:

Annual Benefit of accepting the Discount

$$\frac{₹ 1.5}{₹ 100 - ₹ 1.50} \times \frac{365 \text{ days}}{40-10 \text{ days}} = 18.53\%$$

Annual Cost = Opportunity Cost of foregoing interest on investment = 15%

If average invoice amount is ₹ 10,00,000

	If discount is	
	Accepted (₹)	Not Accepted (₹)
Payment to Supplier (₹)	9,85,000	10,00,000
Return on investment of ₹ 9,85,000 for 30 days {₹ 9,85,000 × (30/365) × 15%}		(12,144)
	9,85,000	9,87,856

Thus, from above table it can be seen that it is cheaper to accept the discount.

Question – 44

TM Limited, a manufacturer of colour TV sets is considering the liberalization of existing credit terms to three of their large customers A, B and C. The credit period and likely quantity of TV sets that will be sold to the customers in addition to other sales are as follows:

Quantity sold (No. of TV Sets)

Credit Period (Days)	A	B	C
0	10,000	10,000	-

30	10,000	15,000	-
60	10,000	20,000	10,000
90	10,000	25,000	15,000

The selling price per TV set is ₹ 15,000. The expected contribution is 50% of the selling price. The cost of carrying receivable averages 20% per annum.

You are required to COMPUTE the credit period to be allowed to each customer.

(Assume 360 days in a year for calculation purposes).

(RTP May – 2020)

Solution:

In case of customer A, there is no increase in sales even if the credit is given. Hence comparative statement for B & C is given below:

Particulars	Customer B				Customer C			
	0	30	60	90	0	30	60	90
1. Credit period (days)								
2. Sales Units	10,000	15,000	20,000	25,000	-	-	10,000	15,000
	₹ in lakh				₹ in lakh			
3. Sales Value	1,500	2,250	3,000	3,750	-	-	1,500	2,250
4. Contribution at 50% (A)	750	1,125	1,500	1,875	-	-	750	1,125
5. Receivables:- Credit Period × Sales 360	-	187.5	500	937.5			250	562.5
6. Debtors at cost	-	93.75	250	468.75	-	-	125	281.25
7. Cost of carrying debtors at 20% (B)	-	18.75	50	93.75	-	-	25	56.25
8. Excess of contributions over cost of carrying debtors (A – B)	750	1,106.25	1,406.25	1,781.25	-	-	725	1,068.75

The excess of contribution over cost of carrying Debtors is highest in case of credit period of 90 days in respect of both the customers B and C. Hence, credit period of 90 days should be allowed to B and C.

Question – 45

River limited currently uses the credit terms of 1.5/15 net 45 days and average collection period was 30 days. The company presently having sales of ₹ 50,00,000 and 30% customers availing the discount. The chances of default are currently 5%. Variable cost constitutes 65% and total cost constitute 85% of sales. The company is planning liberalization of credit terms to 2/20 net 50 days. It is expected that sales are likely to increase by ₹ 5,00,000, the default chances are 10% and average collection period will decline to 25 days. There won't be any change in the fixed cost and 50% customers are expected to avail the discount. Tax rate is 35%.

EVALUATE this policy in comparison with the current policy and recommend whether the new policy should be implemented. Assume cost of capital to be 10% (post tax) and 360 days in a year.

(RTP May – 2023)

Solution:**Evaluation of Credit Policies**

Particulars		1.5/15 net 45	2/20 net 50
A	Sales	₹ 50,00,000	₹ 55,00,000
B	Variable Cost (65%)	₹ 32,50,000	₹ 35,75,000
C	Fixed Cost (20% in 1st Case)	₹ 10,00,000	₹ 10,00,000
D	Bad Debts (5% and 10%)	₹ 2,50,000	₹ 5,50,000
E	Discounts		
	(₹ 50,00,000 × 30% × 1.5%)	₹ 22,500	-
	(₹ 55,00,000 × 50% × 2%)	-	₹ 55,000
F	PBT (A-B-C-D-E)	₹ 4,77,500	₹ 3,20,000
G	Tax @ 35%	₹ 1,67,125	₹ 1,12,000
H	PAT	₹ 3,10,375	₹ 2,08,000
I	Opportunity Cost (₹ 32,50,000 + ₹ 10,00,000) × 30/360 × 10% (₹ 35,75,000 + ₹ 10,00,000) × 25/360 × 10%	₹ 35,417 -	- ₹ 31,771
J	Net Benefit	₹ 2,74,958	₹ 1,76,229

The new policy leads to lower net benefit for the company. Hence it should not be implemented.

Question – 46

Tony Limited, manufacturer of Colour TV sets is considering the liberalization of existing credit terms to three of their large customers A, B and C. The credit

period and likely quantity of TV sets that will be sold to the customers in addition to other sales are as follows:

Quantity sold (No. of TV Sets)

Credit Period (Days)	A	B	C
0	1,000	1,000	-
30	1,000	1,500	-
60	1,000	2,000	1,000
90	1,000	2,500	1,500

The selling price per TV set is ₹ 9,000. The expected contribution is 20% of the selling price. The cost of carrying receivable averages 20% per annum.

You are required:

- COMPUTE the credit period to be allowed to each customer.
(Assume 360 days in a year for calculation purposes).
- DEMONSTRATE the other problems the company might face in allowing the credit period as determined in (a) above?

(RTP Nov – 2018)

Solution:

- In case of customer A, there is no increase in sales even if the credit is given. Hence comparative statement for B & C is given below:

Particulars	Customer B				Customer C			
1. Credit period (days)	0	30	60	90	0	30	60	90
2. Sales Units	1,000	1,500	2,000	2,500	-	-	1,000	1,500
	₹ in lakhs				₹ in lakhs			
3. Sales Value	90	135	180	225	-	-	90	135
4. Contribution at 20% (A)	18	27	36	45	-	-	18	27
5. Receivables: <u>Credit Period × Sales</u> 360	-	11.25	30	56.25	-	-	15	33.75
6. Debtors at cost i.e. 80% of 11.25	-	9	24	45	-	-	12	27
7. Cost of carrying debtors at 20%	-	1.8	4.8	9	-	-	2.4	5.4

(B)								
8. Excess of contributions over cost of carrying debtors (A – B)	18	25.2	31.2	36	-	-	15.6	21.6

The excess of contribution over cost of carrying Debtors is highest in case of credit period of 90 days in respect of both the customers B and C. Hence, credit period of 90 days should be allowed to B and C.

(b) Problem:

- (i) Customer A is taking 1000 TV sets whether credit is given or not. Customer C is taking 1000 TV sets at credit for 60 days. Hence A also may demand credit for 60 days compulsorily.
- (ii) B will take 2500 TV sets at credit for 90 days whereas C would lift 1500 sets only. In such case B will demand further relaxation in credit period i.e. B may ask for 120 days credit.

Question – 47

A regular customer of your company has approached to you for extension of credit facility for purchasing of goods. On analysis of past performance and on the basis of information supplied, the following pattern of payment schedule emerges:

Pattern of Payment Schedule	
At the end of 30 days	20% of the bill
At the end of 60 days	30% of the bill.
At the end of 90 days	30% of the bill.
At the end of 100 days	18% of the bill.
Non-recovery	2% of the bill.

The customer wants to enter into a firm commitment for purchase of goods of ₹ 30 lakhs in 2019, deliveries to be made in equal quantities on the first day of each quarter in the calendar year. The price per unit of commodity is ₹ 300 on which a profit of ₹ 10 per unit is expected to be made. It is anticipated that taking up of this contract would mean an extra recurring expenditure of ₹ 10,000 per annum. If the opportunity cost is 18% per annum, would you as the finance manager of the company RECOMMEND the grant of credit to the customer? Assume 1 year = 360 days.

(RTP Nov – 2019)

Solution:**Statement showing the Evaluation of credit Policies**

Particulars		Proposed Policy ₹
A.	Expected Profit:	
(a)	Credit Sales	30,00,000
(b)	Total Cost	
(i)	Variable Costs	29,00,000
(ii)	Recurring Costs	10,000
		29,10,000
(c)	Bad Debts	60,000
(d)	Expected Profit [(a) – (b) – (c)]	30,000
B.	Opportunity Cost of Investments in Receivables	1,00,395
C.	Net Benefits (A – B)	(70,395)

Recommendation: The Proposed Policy should not be adopted since the net benefits under this policy are negative

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

Particulars	20%	30%	30%	18%	Total
A. Total Cost	5,82,000	8,73,000	8,73,000	5,23,800	28,51,800
B. Collection period	30/360	60/360	90/360	100/360	
C. Required Rate of Return	18%	18%	18%	18%	
D. Opportunity Cost (A × B × C)	8,730	26,190	39,285	26,190	1,00,395

Question – 48

A company wants to follow a more prudent policy to improve its sales for the region which is ₹ 9 lakhs per annum at present, having an average collection period of 45 days. After certain researches, the management consultant of the company reveals the following information:

Credit Policy	Increase in collection period	Increase in sales	Present default anticipated
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W	15 days	60,000	1.5 %
X	30 days	90,000	2 %
Y	45 days	1,50,000	3 %
Z	70 days	2,10,000	4 %

The selling price per unit is ₹ 3. Average cost per unit is ₹ 2.25 and variable costs per unit are ₹ 2. The current bad debt loss is 1%. Required return on additional investment is 20%. (Assume 360 days year)

ANALYSE which of the above policies would you recommend for adoption?

(RTP Nov – 2020)

Solution:

A. Statement showing the Evaluation of Debtors Policies (Total Approach)

(Amount in ₹)

Particulars		Present Policy 45 days	Proposed Policy W 60 days	Proposed Policy X 75 days	Proposed Policy Y 90 days	Proposed Policy Z 115 days
I	Expected Profit:					
	(a) Credit Sales	9,00,000	9,60,000	9,90,000	10,50,000	11,10,000
	(b) Total Cost other than Bad Debts					
	(i) Variable Costs [Sales × 2/ 3]	6,00,000	6,40,000	6,60,000	7,00,000	7,40,000
	(ii) Fixed Costs	75,000	75,000	75,000	75,000	75,000
		6,75,000	7,15,000	7,35,000	7,75,000	8,15,000
	(c) Bad Debts	9,000	14,400	19,800	31,500	44,400
	(d) Expected Profit [(a) – (b) – (c)]	2,16,000	2,30,600	2,35,200	2,43,500	2,50,600
II.	Opportunity Cost of Investments in Receivables	16,875	23,833	30,625	38,750	52,069
III.	Net Benefits (I – II)	1,99,125	2,06,767	2,04,575	2,04,750	1,98,531

Recommendation: The Proposed Policy W (i.e. increase in collection period by 15 days or total 60 days) should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Notes:

(i) **Calculation of Fixed Cost** = [Average Cost per unit – Variable Cost per unit] × No. of Units sold

$$= [₹ 2.25 - ₹ 2.00] \times (₹ 9,00,000/3)$$

$$= ₹ 0.25 \times 3,00,000 = ₹ 75,000$$

(ii) **Calculation of Opportunity Cost of Average Investments**

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$\text{Present Policy} = 6,75,000 \times \frac{45}{360} \times \frac{20}{100} = 16,875$$

$$\text{Policy W} = 7,15,000 \times \frac{60}{360} \times \frac{20}{100} = 23,833$$

$$\text{Policy X} = 7,35,000 \times \frac{75}{360} \times \frac{20}{100} = 30,625$$

$$\text{Policy Y} = 7,75,000 \times \frac{90}{360} \times \frac{20}{100} = 38,750$$

$$\text{Policy Z} = 8,15,000 \times \frac{115}{360} \times \frac{20}{100} = 52,069$$

B. Another method of solving the problem is Incremental Approach. Here we assume that sales are all credit sales. **(Amount in ₹)**

Particulars		Present Policy 45 days	Proposed Policy W 60 days	Proposed Policy X 75 days	Proposed Policy Y 90 days	Proposed Policy Z 115 days
I	Incremental Expected Profit:					
	(a) Incremental Credit Sales	0	60,000	90,000	1,50,000	2,10,000
	(b) Incremental Costs					
	(i) Variable	6,00,000	40,000	60,000	1,00,000	1,40,000

	Costs					
(ii)	Fixed Costs	75,000	-	-	-	-
(c)	Incremental Bad Debt Losses	9,000	5,400	10,800	22,500	35,400
(d)	Incremental Expected Profit (a – b – c)]		14,600	19,200	27,500	34,600
II.	Required Return on Incremental Investments:					
(a)	Cost of Credit Sales	6,75,000	7,15,000	7,35,000	7,75,000	8,15,000
(b)	Collection period	45	60	75	90	115
(c)	Investment in Receivable (a × b/360)	84,375	1,19,167	1,53,125	1,93,750	2,60,347
(d)	Incremental Investment in Receivables	-	34,792	68,750	1,09,375	1,75,972
(e)	Required Rate of Return (in %)		20	20	20	20
(f)	Required Return on Incremental Investments (d × e)	-	6,958	13,750	21,875	35,194
III.	Net Benefits (I – II)	-	7,642	5,450	5,625	(594)

Recommendation: The Proposed Policy W should be adopted since the net benefits under this policy are higher than those under other policies.

C. Another method of solving the problem is by computing the Expected Rate of Return.

$$\text{Expected Rate of Return} = \frac{\text{Incremental Expected Profit}}{\text{Incremental Investment in Receivables}} \times 100$$

$$\text{For Policy W} = \frac{\text{₹ 14,600}}{\text{₹ 34,792}} \times 100 = 41.96\%$$

$$\text{For Policy X} = \frac{\text{₹ 19,200}}{\text{₹ 68,750}} \times 100 = 27.93\%$$

$$\text{For Policy Y} = \frac{₹ 27,500}{₹ 1,09,375} \times 100 = 25.14\%$$

$$\text{For Policy Z} = \frac{₹ 34,600}{₹ 1,75,972} \times 100 = 19.66\%$$

Recommendation: The Proposed Policy W should be adopted since the Expected Rate of Return (41.96%) is more than the Required Rate of Return (20%) and is highest among the given policies compared.

Question – 49

A regular customer of your company has approached to you for extension of credit facility for purchasing of goods. On analysis of past performance and on the basis of information supplied, the following pattern of payment schedule emerges:

Pattern of Payment Schedule	
At the end of 30 days	20% of the bill
At the end of 60 days	30% of the bill.
At the end of 90 days	30% of the bill
At the end of 100 days	18% of the bill
Non-recovery	2% of the bill

The customer wants to enter into a firm commitment for purchase of goods of ₹ 40 lakhs in 2022, deliveries to be made in equal quantities on the first day of each quarter in the calendar year. The price per unit of commodity is ₹ 400 on which a profit of ₹ 20 per unit is expected to be made. It is anticipated that taking up of this contract would mean an extra recurring expenditure of ₹ 20,000 per annum. If the opportunity cost is 18% per annum, would you as the finance manager of the company RECOMMEND the grant of credit to the customer? Assume 1 year = 360 days.

(RTP Nov – 2023)

Solution:

Statement showing the Evaluation of credit Policies

Particulars	Proposed Policy ₹
A. Expected Profit:	
(a) Credit Sales	40,00,000
(b) Total Cost	
(i) Variable Costs (₹ 380 × 10000 units)	38,00,000
(ii) Recurring Costs	20,000

	38,20,000
(c) Bad Debts	80,000
(d) Expected Profit [(a) – (b) – (c)]	1,00,000
B. Opportunity Cost of Investments in Receivables	1,31,790
C. Net Benefits (A – B)	(31,790)

Recommendation: The Proposed Policy should not be adopted since the net benefits under this policy are negative.

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

Particulars	20%	30%	30%	18%	Total
A. Total Cost	7,64,000	11,46,000	11,46,000	6,87,600	37,43,600
B. Collection Period	30/360	60/360	90/360	100/360	
C. Required Rate of Return	18%	18%	18%	18%	
D. Opportunity Cost (A × B × C)	11,460	34,380	51,570	34,380	1,31,790

Question – 50

Current annual sale of SKD Ltd. is ₹ 360 lakhs. It's directors are of the opinion that company's current expenditure on receivables management is too high and with a view to reduce the expenditure they are considering following two new alternate credit policies:

	Policy X	Policy Y
Average collection period	1.5 months	1 month
% of default	2%	1%
Annual collection expenditure	₹ 12 lakh	₹ 20 lakh

Selling price per unit of product is ₹ 150. Total cost per unit is ₹ 120.

Current credit terms are 2 months and percentage of default is 3%.

Current annual collection expenditure is ₹ 8 lakh. Required rate of return on investment of SKD Ltd. is 20%. Determine which credit policy SKD Ltd. should follow.

(Exam, July – 2021)

Solution:

Statement showing the Evaluation of Credit policies (Total Approach)

Particulars		Present Policy (2 Months)	Proposed Policy X (1.5 Months)	Proposed Policy Y (1 Month)
		₹ in lakhs	₹ in lakhs	₹ in lakhs
A.	Expected Profit:			
	(a) Credit Sales*	360	360	360
	(b) Total Cost other than Bad Debts and collection expenditure (360/150 × 120)	288	288	288
	(c) Bad Debts	10.8 (360 × 0.03)	7.2 (360 × 0.02)	3.6 (360 × 0.01)
	(d) Collection expenditure	8	12	20
	(e) Expected Profit [(a) – (b) – (c) – (d)]	53.2	52.8	48.4
B.	Opportunity Cost of Investments in Receivables (Working Note)	9.6	7.2	4.8
C.	Net Benefits (A – B)	43.6	45.6	43.6

Recommendation: The Proposed Policy X should be followed since the net benefits under this policy are higher as compared to other policies.

***Note:** It is assumed that all sales are on credit.

Working Note:

Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{12} \times \frac{\text{Rate of Return}}{100}$$

$$\text{Present Policy} = ₹ 288 \text{ lakhs} \times \frac{2}{12} \times \frac{20}{100} = ₹ 9.6 \text{ lakhs}$$

$$\text{Policy X} = ₹ 288 \text{ lakhs} \times \frac{1.5}{12} \times \frac{20}{100} = ₹ 7.2 \text{ lakhs}$$

$$\text{Policy Y} = ₹ 288 \text{ lakhs} \times \frac{1}{12} \times \frac{20}{100} = ₹ 4.8 \text{ lakhs}$$

Alternatively

**Statement showing the Evaluation of Credit policies
(Incremental Approach)**

Particulars		Present Policy (2 Months)	Proposed Policy X (1.5 Months)	Proposed Policy Y (1 Month)
		₹ in lakhs	₹ in lakhs	₹ in lakhs
(a)	Credit Sales*	360	360	360
(b)	Cost of sales (360/150 × 120)	288	288	288
(c)	Receivables (Refer Working Note)	48	36	24
(d)	Reduction in receivables from present policy	-	12	24
(A)	Savings in Opportunity Cost of Investment in Receivables (@ 20%)	-	2.4	4.8
(e)	Bad Debts (360 × 0.03)	10.8	7.2	3.6
(B)	Reduction in bad debts from present policy	-	3.6	7.2
(f)	Collection expenditure	8	12	20
(C)	Increase in Collection expenditure from Present policy	-	4	12
(D)	Net Benefits (A + B – C)		2	0

Recommendation: The Proposed Policy X should be followed since the net benefits under this policy are higher as compared to other policies.

***Note:** It is assumed that all sales are on credit.

Working Note:

Calculation of Investment in Receivables

$$= \text{Total Cost} \times \frac{\text{Collection period}}{12}$$

$$\text{Present Policy} = ₹ 288 \text{ lakhs} \times \frac{2}{12} = ₹ 48 \text{ lakhs}$$

$$\text{Policy X} = ₹ 288 \text{ lakhs} \times \frac{1.5}{12} = ₹ 36 \text{ lakhs}$$

$$\text{Policy Y} = ₹ 288 \text{ lakhs} \times \frac{1}{12} = ₹ 24 \text{ lakhs}$$

Question – 51

MN Ltd. has a current turnover of 30,00,000 p.a. Cost of sales is 80% of turnover and Bad Debts are 2% of turnover, Cost of sales includes 70% Variable cost and 30% fixed Cost, While Company's required rate of return is 15%. MN Ltd. currently allows 15 days credit to its customer, but it is considering increases this to 45 days credit in order to increase turnover.

It has been estimated that this change in policy will increase turnover by 20%, while Bed Debts will increase by 1%. It is not expected that the policy change will result in an increase in fixed cost and creditors and stock will be unchanged.

Should MN Ltd. introduce the proposed policy ? (Assume a 360 day year)

(Exam, Nov – 2018)

Solution:

Student Notes to avoid Possible Mistakes:

- (a) 'Cost of Sales' given in the question should be interpreted as 'Cost of Goods Sold'. It is 80% of sales.
- (b) Variable cost is given as 70% of cost of sales and not 70% of sales. It means, variable cost is 70% of 80%, i.e. 56% of sales.
- (c) Fixed cost is also given as 30% of cost of sales and it will remain same.
- (d) Credit period at present is 15 days and it will increase to 45 days. It will not increase by 45 days, but will increase to 45 days.

Statement Showing Evaluation of Credit Policies:

(Figures in ₹)

Particulars	Present Policy	Proposed Policy
(a) Sales Turnover	30,00,000 (Given)	36,00,000 (30L + 20%)
(b) Variable Cost [56% of (a)]	16,80,000	20,16,000
(c) Fixed Cost [30,00,000 × 80% × 30%]	7,20,000	7,20,000
(d) Total Cost of Sales [b + c]	24,00,000	27,36,000
(e) Bad debts as % of sales	2%	3%
(f) Bad debt loss [a × e]	60,000	1,08,000
(g) Profit [a - d - e]	5,40,000	7,56,000
(h) Credit Period	15 days	45 days
(i) Investment in receivables [d × h/360 days]	1,00,000	3,42,000
(j) Opportunity cost [15% × (i)]	15,000	51,300
(k) Net Benefit [g - j]	5,25,000	7,04,700
(l) Incremental benefit to the company	---	1,79,700

Recommendation: Proposed Policy i.e. credit of 45 days should be implemented by MN Ltd. since the net benefit under this policy is higher than those under present policy.

Question – 52

A company has current sale of ₹ 12 lakhs per year. The profit-volume ratio is 20% and post-tax cost of investment in receivables is 15%. The current credit terms are 1/10, net 50 days and average collection period is 40 days. 50% of customers in terms of sales revenue are availing cash discount and bad debt is 2% of sales.

In order to increase sales, the company want to liberalize its existing credit terms to 2/10, net 35 days. Due to which, expected sales will increase to ₹ 15 lakhs. Percentage of default in sales will remain same. Average collection period will decrease by 10 days. 80% of customers in terms of sales revenue are expected to avail cash discount under this proposed policy.

Tax rate is 30%.

ADVISE, should the company change its credit terms. (Assume 360 days in a year.)

(Exam, May – 2023)

Solution:

(i) Calculation of Cash Discount

Cash Discount = Total credit sales × % of customers who take up discount × Rate

$$\text{Present Policy} = \frac{12,00,000 \times 50 \times 0.01}{100} = ₹ 6,000$$

$$\text{Proposed Policy} = ₹ 15,00,000 \times 0.80 \times 0.02 = ₹ 24,000$$

(ii) Opportunity Cost of Investment in Receivables

Present Policy: Opportunity Cost

$$= \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$= ₹ 9,60,000 \times \frac{40}{360} \times \frac{15}{100} = ₹ 16,000$$

$$\text{Proposed Policy:} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$= 12,00,000 \times \frac{30}{360} \times \frac{15}{100} = ₹ 15,000$$

Statement showing Evaluation of Credit Policies

Particulars	Present Policy	Proposed Policy
Credit Sales	12,00,000	15,00,000
Variable Cost @ 80%* of sales	9,60,000	12,00,000
Bad Debts @ 2%	24,000	30,000
Cash Discount	6,000	24,000
Profit before tax	2,10,000	2,46,000
Tax @ 30%	63,000	73,800
Profit after Tax	1,47,000	1,72,200
Opportunity Cost of Investment in Receivables	16,000	15,000

Net Profit	1,31,000	1,57,200
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*Only relevant or variable costs are considered for calculating the opportunity costs on the funds blocked in receivables. Since 20% is profit-volume ratio, hence the relevant costs are taken to be 80% of the respective sales.

Advise: Proposed policy should be adopted since the net benefit is increased by (₹ 1,57,200 - ₹ 1,31,000) = ₹ 26,200.

Alternative presentation using incremental approach

	₹
Incremental sales (15,00,000 – 12,00,000)	3,00,000
Less: Incremental variable cost (12,00,000 – 9,60,000)	2,40,000
Less: Incremental Bad debts (30,000 – 24,000)	6,000
Less: Incremental Cash discount (24,000 – 6,000)	18,000
Increase in Profit Before Tax	36,000
Less: Tax @ 30%	10,800
Increase in Profit After Tax	25,200
Add: Savings in opportunity cost (16,000 – 15,000)	1,000
Increase in Net Profit	26,200

Advise: Proposed policy should be adopted since the net benefit is increased by (₹ 1,57,200 – ₹ 1,31,000)
= ₹ 26,200.

Question – 53

GT Ltd. is taking into account the revision of its credit policy with a view to increasing its sales and profit. Currently, all its sales are on one month credit. Other information is as follows:

Contribution	2/5 th of Sales Revenue
Additional funds raising cost	20% per annum

The marketing manager of the company has given the following options along with estimates for considerations:

Particulars	Current Position	Option I	Option II	Option III
Sales Revenue (₹)	40,00,000	42,00,000	44,00,000	50,00,000
Credit period (in months)	1	1½	2	3
Bad debts (% of sales)	2	2½	3	5
Cost of Credit administration (₹)	24,000	26,000	30,000	60,000

You are required to ADVISE the company for the best option.

(MTP Sep – 2022)

Solution:

Statement Showing Evaluation of Credit Policies

(₹ In Lakhs)

Particulars	Current position (1 month)	Option I (1.5 months)	Option II (2 months)	Option III (3 months)
Sales Revenue	40,00,000	42,00,000	44,00,000	50,00,000
Contribution @ 40%	16,00,000	16,80,000	17,60,000	20,00,000
Increase in contribution over current level (A)	-	80,000	1,60,000	4,00,000
Debtors = Average Collection × Credit Sales $\left(\frac{\quad}{12} \right)$	$\frac{1 \times 40,00,000}{12}$ = 3,33,333.33	$\frac{1.5 \times 42,00,000}{12}$ = 5,25,000	$\frac{2 \times 44,00,000}{12}$ = 7,33,333.33	$\frac{3 \times 50,00,000}{12}$ = 12,50,000
Increase in debtors over current level	-	1,91,666.67	4,00,000.00	9,16,666.67
Cost of funds for additional amount of debtors @ 20% (B)	-	38,333.33	80,000.00	1,83,333.33
Credit administrative cost	24,000	26,000	30,000	60,000
Increase in credit administration cost over present level (C)	-	2,000	6,000	36,000
Bad debts	80,000	1,05,000	1,32,000	2,50,000
Increase in bad debts over current levels (D)	-	25,000	52,000	1,70,000
Net gain/loss A – (B + C + D)	-	14,666.67	22,000.00	10,666.67

Advise: It is suggested that the company GT Ltd. should implement Option II with a net gain of ₹ 22,000 which has a credit period of 2 months.

(3) FACTORING

Question – 54

A Factoring firm has credit sales of ₹ 360 lakhs and its average collection period is 30 days. The financial controller estimates, bad debt losses are around 2% of credit sales. The firm spends ₹ 1,40,000 annually on debtors administration. This cost comprises of telephonic and fax bills along with salaries of staff members. These are the avoidable costs. A Factoring firm has offered to buy the firm's receivables. The factor will charge 1% commission and will pay an advance against receivables on an interest @15% p.a. after withholding 10% as reserve. What should the firm do?

Assume 360 days in a year.

(Study Material ICAI Illus – 15)

Solution:

Working Notes:

Average level of receivables = ₹ 360 lakhs × $\frac{30}{360}$	= 30 lakhs
Factoring Commission = 1% of ₹ 30,00,000	= ₹ 30,000
Reserve = 10% of ₹ 30,00,000	= ₹ 3,00,000
Total (i)	<u>= ₹ 3,30,000</u>
Thus the amount available for advance is	
Average level of receivables	₹ 30,00,000
Less: Total (i) from above	<u>₹ 3,30,000</u>
(ii)	₹ 26,70,000
Less: Interest @ 15% p.a. for 30 days	<u>₹ 33,375</u>
Net Amount of Advance available.	₹ 26,36,625

Evaluation of Factoring Proposal

	Particulars	₹	₹
A.	Saving (Benefit) to the firm		
	Cost of credit administration	₹ 1,40,000	₹ 1,40,000
	Cost of bad-debt losses	(0.02 × 360 lakhs)	₹ 7,20,000
	Total		₹ 8,60,000
B.	Cost to the Firm:		
	Factoring commission [annual credit sales × % of commission (or calculated annually)]	₹ 30,000 × $\frac{360}{30}$	₹ 3,60,000
	Interest Charges	₹ 33,375 × $\frac{360}{30}$	₹ 4,00,500
	Total		₹ 7,60,500
C.	Net Benefit to the firm: (A – B)		₹ 99,500

Advice: Since the saving to the firm exceeds the cost to the firm on account of factoring. Therefore, the proposal is acceptable.

(4) CASH MANAGEMENT

Question – 55

Prepare monthly cash budget for six months beginning from April 2017 on the basis of the following information:

- i. Estimated monthly sales are as follows:

	(₹)		(₹)
January	1,00,000	June	80,000
February	1,20,000	July	1,00,000
March	1,40,000	August	80,000
April	80,000	September	60,000
May	60,000	October	1,00,000

- ii. Wages and salaries are estimated to be payable as follows:

	₹		₹
April	9,000	July	10,000
May	8,000	August	9,000
June	10,000	September	9,000

- iii. Of the sales, 80% is on credit and 20% for cash. 75% of the credit sales are collected within one month and the balance in two months. There are no bad debt losses.

- iv. Purchases amount to 80% of sales and are made on credit and paid for in the month preceding the sales.
- v. The firm has 10% debentures of ₹ 1,20,000. Interest on these has to be paid quarterly in January, April and so on.
- vi. The firm is to make an advance payment of tax of ₹ 5,000 in July, 2017.
- vii. The firm had a cash balance of ₹ 20,000 on April 1, 2017, which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary investments/liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).

(Study Material ICAI Illus – 06)

Solution:

Workings:

Collection from debtors:

(Amount in ₹)

	Feb	Mar	Apr	May	June	July	Aug	Sep
Total sales	1,20,000	1,40,000	80,000	60,000	80,000	1,00,000	80,000	60,000
Credit sales (80% of total sales)	96,000	1,12,000	64,000	48,000	64,000	80,000	64,000	48,000
Collections:								
One month		72,000	84,000	48,000	36,000	48,000	60,000	48,000
Two months			24,000	28,000	16,000	12,000	16,000	20,000
Total collections			1,08,000	76,000	52,000	60,000	76,000	68,000

Monthly Cash Budget for Six months, April to September, 2022

(Amount in ₹)

	Apr	May	June	July	Aug	Sep
Receipts:						
Opening balance	20,000	20,000	20,000	20,000	20,000	20,000
Cash sales	16,000	12,000	16,000	20,000	16,000	12,000
Collection from debtors	1,08,000	76,000	52,000	60,000	76,000	68,000
Total cash available (A)	1,44,000	1,08,000	88,000	1,00,000	1,12,000	1,00,000
Payments:						
Purchases	48,000	64,000	80,000	64,000	48,000	80,000

Wages & salaries	9,000	8,000	10,000	10,000	9,000	9,000
Interest on debentures	3,000	---	---	3,000	---	---
Tax payment	---	---	---	5,000	---	---
Total payments (B)	60,000	72,000	90,000	82,000	57,000	89,000
Minimum cash balance desired	20,000	20,000	20,000	20,000	20,000	20,000
Total cash needed (C)	80,000	92,000	1,10,000	1,02,000	77,000	1,09,000
Surplus - deficit (A-C)	64,000	16,000	(22,000)	(2,000)	35,000	(9,000)
Investment/financing						
Temporary Investments	(64,000)	(16,000)	----		(35,000)	-----
Liquidation of temporary investments or temporary borrowings	----	----	22,000	2,000	----	9,000
Total effect of investment/financing (D)	(64,000)	(16,000)	22,000	2,000	(35,000)	9,000
Closing cash balance (A+D-B)	20,000	20,000	20,000	20,000	20,000	20,000

Question – 56

From the following information relating to a departmental store, you are required to prepare for the three months ending 31st March, 2017:

- Month-wise cash budget on receipts and payments basis; and
- Statement of Sources and uses of funds for the three months period.

It is anticipated that the working capital at 1st January, 2017 will be as follows :-

			₹ in '000's
Cash in hand and at bank			545
Short term investments			300
Debtors			2,570
Stock			1,300
Trade creditors			2,110
Other creditors			200
Dividends payable			485
Tax due			320
Plant			800
Budgeted Profit Statement:	₹ in '000's		
	January	February	March
Sales	2,100	1,800	1,700
Cost of sales	1,635	1,405	1,330

Gross Profit	465	395	370
Administrative, Selling and Distribution Expenses	315	270	255
Net Profit before tax	150	125	115

Budgeted balances at the end of each months	₹ in '000's		
	31 st Jan.	28 th Feb.	31 st March
Short term investments	700	-	200
Debtors	2,600	2,500	2,350
Stock	1,200	1,100	1,000
Trade creditors	2,000	1,950	1,900
Other creditors	200	200	200
Dividends payable	485	-	-
Tax due	320	320	320
Plant (depreciation ignored)	800	1,600	1,550

Depreciation amount to ₹ 60,000 is included in the budgeted expenditure for each month.

(Study Material ICAI Illus – 07)

Solution:

Working:

		₹ in '000		
		Jan.	Feb.	March
(1)	Payments to creditors:			
	Cost of goods sold	1,635	1,405	1,330
	Add: Closing Stocks	1,200	1,100	1,000
		2,835	2,505	2,330
	Less: Opening Stocks	1,300	1,200	1,100
	Purchase	1,535	1,305	1,230
	Add: Trade Creditors, Opening Balance	2,110	2,000	1,950
		3,645	3,305	3,180
	Less: Trade Creditors, Closing Balance	2,000	1,950	1,900
	Payment	1,645	1,355	1,280
(2)	Receipts from debtors:			
	Debtors, Opening Balance	2,570	2,600	2,500
	Add: Sales	2,100	1,800	1,700
		4,670	4,400	4,200
	Less: Debtors, Closing Balance	2,600	2,500	2,350

Receipt	2,070	1,900	1,850
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Cash Budget

(a) 3 months ending 31st March, 2022

(₹ in 000)			
	January, 2022	February, 2022	March, 2022
Opening cash balances	545	315	65
Add: Receipts:			
From Debtors	2,070	1,900	1,850
Sale of Investments	---	700	---
Sale of Plant	---	---	50
Total (A)	2,615	2,915	1,965
Deduct: Payments			
Creditors	1,645	1,355	1,280
Expenses	255	210	195
Capital Expenditure	---	800	---
Payment of dividend	---	485	---
Purchase of investments	400	---	200
Total payments (B)	2,300	2,850	1,675
Closing cash balance (A-B)	315	65	290

(b) Statement of Sources and uses of Funds for the three month period ending 31st March, 2022

	₹ '000	₹ '000
Sources:		
Funds from operation:		
Net profit (150 + 125 + 115)	390	
Add: Depreciation (60 × 3)	180	570
Sale of plant		50
		620
Decrease in Working Capital (Refer Statement of changes in working capital)		655
Total		1,285
Uses:		
Purchase of plant		800
Payment by dividends		485
Total		1,285

Statement of Changes in Working Capital

	January,22	March,22	Increase	Decrease
	₹' 000	₹' 000	₹' 000	₹' 000
Current Assets				
Cash in hand and at Bank	545	290		255
Short term Investments	300	200		100
Debtors	2,570	2,350		220
Stock	1,300	1,000		300
	4,715	3,840		
Current Liabilities				
Trade Creditors	2,110	1,900	210	---
Other Creditors	200	200	---	---
Tax Due	320	320	---	---
	2,630	2,420		
Working Capital	2,085	1,420		
Decrease	-	665	665	
	2,085	2,085	875	875

Question – 57

You are given below the Profit & Loss Accounts for two years for a company:

Profit and Loss Account

	Year 1	Year 2		Year 1	Year 2
	(₹)	(₹)		(₹)	(₹)
To Opening stock	80,00,000	1,00,00,000	By Sales	8,00,00,000	10,00,00,000
To Raw materials	3,00,00,000	4,00,00,000	By Closing stock	1,00,00,000	1,50,00,000
To Stores	1,00,00,000	1,20,00,000	By Misc. Income	10,00,000	10,00,000
To Manufacturing Expenses	1,00,00,000	1,60,00,000			
To Other Expenses	1,00,00,000	1,00,00,000			
To Depreciation	1,00,00,000	1,00,00,000			
To Net Profit	1,30,00,000	1,80,00,000			
	9,10,00,000	11,60,00,000		9,10,00,000	11,60,00,000

Sales are expected to be ₹ 12,00,00,000 in year 3.

As a result, other expenses will increase by ₹ 50,00,000 besides other charges. Only raw materials are in stock. Assume sales and purchases are in cash

terms and the closing stock is expected to go up by the same amount as between year 1 and 2. You may assume that no dividend is being paid. The Company can use 75% of the cash generated to service a loan. How much cash from operations will be available in year 3 for the purpose? Ignore income tax.

(Study Material ICAI Illus – 08)

Solution:

Projected Profit and Loss Account for the year 3

	Year 2 Actual (₹ in lakhs)	Year 3 Project ed (₹ in lakhs)		Year 2 Actual (₹ in lakhs)	Year 3 Project ed (₹ in lakhs)
To Materials consume	350	420	By Sales	1,000	1,200
To Stores	120	144	By Misc. Income	10	10
To Mfg. Expenses	160	192			
To Other expenses	100	150			
To Depreciation	100	100			
To Net profit	180	204			
	1,010	1,210		1,010	1,210

Cash Flow:

	(₹ in lakhs)
Profit	204
Add: Depreciation	100
	304
Less: Cash required for increase in stock	50
Net cash inflow	254

Available for servicing the loan: 75% of ₹ 2,54,00,000 or ₹ 1,90,50,000

Working Notes:

(i) Material consumed in year 2: 35% of sales,

Likely consumption in year 3: ₹ 1,200 × $\frac{35}{100}$ or ₹ 420 (lakhs)

(ii) Stores are 12% of sales, as in year 2.

(iii) Manufacturing expenses are 16% of sales.

Note: The above also shows how a projected profit and loss account is prepared.

Question – 58

Prachi Ltd is a manufacturing company producing and selling a range of cleaning products to wholesale customers. It has three suppliers and two customers. Prachi Ltd relies on its cleared funds forecast to manage its cash.

You are an accounting technician for the company and have been asked to prepare a cleared funds forecast for the period Monday 7 January to Friday 11 January 2017 inclusive. You have been provided with the following information:

1. Receipts from customers

Customer name	Credit terms	Payment method	7 Jan 2017 sales	7 Dec 2016 sales
W Ltd	1 calendar month	BACS	₹ 150,000	₹ 130,000
X Ltd	None	Cheque	₹ 180,000	₹ 160,000

- Receipt of money by BACS (Bankers' Automated Clearing Services) is instantaneous.
- X Ltd's cheque will be paid into Prachi Ltd's bank account on the same day as the sale is made and will clear on the third day following this (excluding day of payment).

2. Payments to suppliers

Supplier name	Credit terms	Payment method	7 Jan 2017 purchases	7 Dec 2016 purchases	7 Nov 2016 purchases
A Ltd	1 calendar month	Standing order	₹ 65,000	₹ 55,000	₹ 45,000
B Ltd	2 calendar months	Cheque	₹ 85,000	₹ 80,000	₹ 75,000
C Ltd	None	Cheque	₹ 95,000	₹ 90,000	₹ 85,000

- Prachi Ltd has set up a standing order for ₹ 45,000 a month to pay for supplies from A Ltd. This will leave Prachi's bank account on 7

January. Every few months, an adjustment is made to reflect the actual cost of supplies purchased (you do not need to make this adjustment).

- (b) Prachi Ltd will send out, by post, cheques to B Ltd and C Ltd on 7 January. The amounts will leave its bank account on the second day following this (excluding the day of posting)

3. Wages and salaries

	December 2016	January 2017
Weekly wages	₹ 12,000	₹ 13,000
Monthly salaries	₹ 56,000	₹ 59,000

- (a) Factory workers are paid cash wages (weekly). They will be paid one week's wages, on 11 January, for the last week's work done in December (i.e. they work a week in hand).
- (b) All the office workers are paid salaries (monthly) by BACS. Salaries for December will be paid on 7 January.

4. Other miscellaneous payments

- (a) Every Monday morning, the petty cashier withdraws ₹ 200 from the company bank account for the petty cash. The money leaves Prachi's bank account straight away.
- (b) The room cleaner is paid ₹ 30 from petty cash every Wednesday morning.
- (c) Office stationery will be ordered by telephone on Tuesday 8 January to the value of ₹ 300. This is paid for by company debit card. Such payments are generally seen to leave the company account on the next working day.
- (d) Five new software's will be ordered over the Internet on 10 January at a total cost of ₹ 6,500. A cheque will be sent out on the same day. The amount will leave Prachi Ltd's bank account on the second day following this (excluding the day of posting).

5. Other information

The balance on Prachi's bank account will be ₹ 200,000 on 7 January 2017. This represents both the book balance and the cleared funds.

Required:

Prepare a cleared funds forecast for the period Monday 7 January to Friday 7 January 2017 inclusive using the information provided. Show clearly the un-cleared funds float each day.

(Study Material ICAI Illus – 09)

Solution:

Cleared Funds Forecast

	9 Aug (Saturday) ₹	10 Aug (Sunday) ₹	11 Aug (Monday) ₹	12 Aug (Tuesday) ₹	13 Aug (Wednesday) ₹
Receipts					
W Ltd	1,30,000	0	0	0	0
X Ltd	0	0	0	1,80,000	0
(a)	1,30,000	0	0	1,80,000	0
Payments					
A Ltd	45,000	0	0	0	0
B Ltd	0	0	75,000	0	0
C Ltd	0	0	95,000	0	0
Wages	0	0	0	0	12,000
Salaries	56,000	0	0	0	0
Petty Cash	200	0	0	0	0
Stationery	0	0	300	0	0
(b)	1,01,200	0	1,70,300	0	12,000
Cleared excess Receipts over payments (a) – (b)	28,800	0	(1,70,300)	1,80,000	(12,000)
Cleared balance b/f	2,00,000	2,28,800	2,28,800	58,500	2,38,500
Cleared balance c/f (c)	2,28,800	2,28,800	58,500	2,38,500	2,26,500
Un-cleared funds float					
Receipts	1,80,000	1,80,000	1,80,000	0	0
Payments	(1,70,000)	(1,70,300)	0	(6,500)	(6,500)
(d)	10,000	9,700	180,000	(6,500)	(6,500)
Total book balance c/f	2,38,800	2,38,500	2,38,500	2,32,000	2,20,000
(c) + (d)					

Question – 59

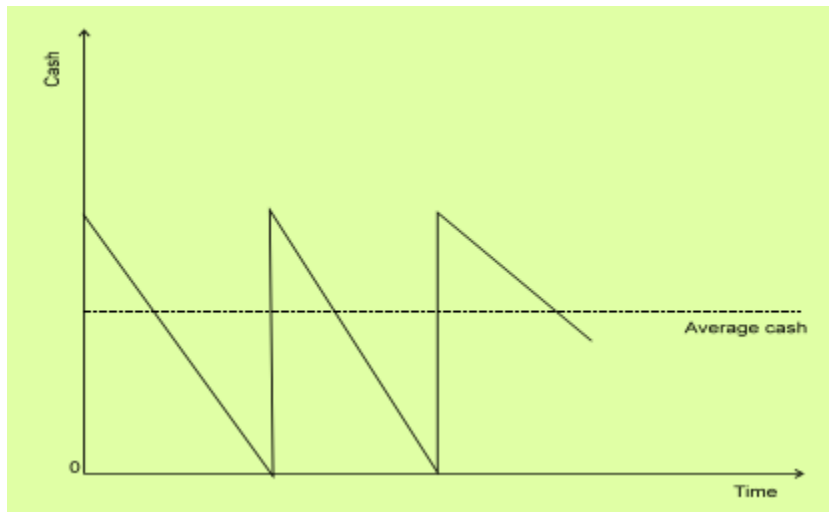
A firm maintains a separate account for cash disbursement. Total disbursement are ₹ 1,05,000 per month or ₹ 12,60,000 per year. Administrative and transaction cost of transferring cash to disbursement account is ₹ 20 per transfer. Marketable securities yield is 8% per annum.

Determine the optimum cash balance according to William J. Baumol model.

(Study Material ICAI Illus – 10)

Solution:

$$\text{The optimum cash balance } C = \sqrt{\frac{2 \times ₹ 12,60,000 \times ₹ 20}{0.08}} = ₹ 25,100$$



The limitation of the Baumol's model is that it does not allow the cash flows to fluctuate. Firms in practice do not use their cash balance uniformly nor are they able to predict daily cash inflows and outflows. The Miller-Orr (MO) model, as discussed below, overcomes this shortcoming and allows for daily cash flow variation.

Question – 60

The following information relates to Zeta Limited, a publishing company:

The selling price of a book is ₹ 15, and sales are made on credit through a book club and invoiced on the last day of the month.

Variable costs of production per book are materials (₹ 5), labour (₹ 4), and overhead (₹ 2)

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Workings:**1. Sale Receipts**

Month	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Forecast sales (S)	1,000	1,000	1,000	1,250	1,500	2,000	1,900	2,200
	₹	₹	₹	₹	₹	₹	₹	₹
$S \times 15$	15,000	15,000	15,000	18,750	22,500	30,000	28,500	33,000
Debtors pay:								
1 month 40%		6,000	6,000	6,000	7,500	9,000	12,000	11,400
2 month 60%		-	9,000	9,000	9,000	11,250	13,500	18,000
	-	-	15,000	15,000	16,500	20,250	25,500	29,400

2. Payment for materials – books produced two months before sale

Month	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Qty produced (Q)	1,000	1,250	1,500	2,000	1,900	2,200	2,200	2,300
	₹	₹	₹	₹	₹	₹	₹	₹
Materials ($Q \times 5$)	5,000	6,250	7,500	10,000	9,500	11,000	11,000	11,500
Paid (2 months after)	-	-	5,000	6,250	7,500	10,000	9,500	11,000

3. Variable overheads

Month	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Qty produced (Q)	1,000	1,250	1,500	2,000	1,900	2,200	2,200	2,300
	₹	₹	₹	₹	₹	₹	₹	₹
Var. overhead ($Q \times 2$)	2,000	2,500	3,000	4,000	3,800			
Var. overhead ($Q \times 2.50$)						5,500	5,500	5,750
Paid one month later		2,000	2,500	3,000	4,000	3,800	5,500	5,500

4. Wages payments

Month	Dec	Jan	Feb	Mar	Apr	May	Jun
Qty produced (Q)	1,250	1,500	2,000	1,900	2,200	2,200	2,300
	₹	₹	₹	₹	₹	₹	₹
Wages ($Q \times 4$)	5,000	6,000	8,000				
Wages ($Q \times 4.50$)				8,550	9,900	9,900	10,350

75% this month	3,750	4,500	6,000	6,412	7,425	7,425	7,762
25% this month		1,250	1,500	2,000	2,137	2,475	2,475
		5,750	7,500	8,412	9,562	9,900	10,237

Cash budget – six months ended June

	Jan ₹	Feb ₹	Mar ₹	Apr ₹	May ₹	Jun ₹
Receipts:						
Credit sales	15,000	15,000	16,500	20,250	25,500	29,400
Premises disposal	-	-	-	-	25,000	-
	15,000	15,000	16,500	20,250	50,500	29,400
Payments:						
Materials	5,000	6,250	7,500	10,000	9,500	11,000
Var. overheads	2,500	3,000	4,000	3,800	5,500	5,500
Wages	5,750	7,500	8,412	9,563	9,900	10,237
Fixed assets	-	-	-	-	10,000	-
Corporation tax	-	-	10,000	-	-	-
	13,250	16,750	29,912	23,363	34,900	26,737
Net cash flow	1,750	(1,750)	(13,412)	(3,113)	15,600	2,663
Balance b/f	1,500	3,250	1,500	(11,912)	(15,025)	575
Cumulative cash flow	3,250	1,500	(11,912)	(15,025)	575	3,238

Question – 61

From the information and the assumption that the cash balance in hand on 1st January 2021 is ₹ 72,500, PREPARE a cash budget.

Assume that 50 per cent of total sales are cash sales. Assets are to be acquired in the months of February and April. Therefore, provisions should be made for the payment of ₹ 8,000 and ₹ 25,000 for the same. An application has been made to the bank for the grant of a loan of ₹ 30,000 and it is hoped that the loan amount will be received in the month of May.

It is anticipated that a dividend of ₹ 35,000 will be paid in June. Debtors are allowed one month's credit. Creditors for materials purchased and overheads grant one month's credit. Sales commission at 3 per cent on sales is paid to the salesman each month.

Month	Sales (₹)	Materials Purchases (₹)	Salaries & Wages (₹)	Production Overheads (₹)	Office and Selling Overheads (₹)
January	72,000	25,000	10,000	6,000	5,500
February	97,000	31,000	12,100	6,300	6,700

March	86,000	25,500	10,600	6,000	7,500
April	88,600	30,600	25,000	6,500	8,900
May	1,02,500	37,000	22,000	8,000	11,000
June	1,08,700	38,800	23,000	8,200	11,500

(Study Material ICAI TYK – 09)

Solution:**Cash Budget**

	Jan ₹	Feb ₹	Mar ₹	Apr ₹	May ₹	June ₹	Total ₹
Receipts							
Cash sales	36,000	48,500	43,000	44,300	51,250	54,350	2,77,400
Collections from debtors	-	36,000	48,500	43,000	44,300	51,250	2,23,050
Bank loan	-	-	-	-	30,000	-	30,000
Total	36,000	84,500	91,500	87,300	1,25,550	1,05,600	5,30,450
Payments							
Materials	-	25,000	31,000	25,500	30,600	37,000	1,49,100
Salaries and wages	10,000	12,100	10,600	25,000	22,000	23,000	1,02,700
Production overheads	-	6,000	6,300	6,000	6,500	8,000	32,800
Office & selling overheads	-	5,500	6,700	7,500	8,900	11,000	39,600
Sales commission	2,160	2,910	2,580	2,658	3,075	3,261	16,644
Capital expenditure	-	8,000	-	25,000	-	-	33,000
Dividend	-	-	-	-	-	35,000	35,000
Total	12,160	59,510	57,180	91,658	71,075	1,17,261	4,08,844
Net cash flow	23,840	24,990	34,320	(4,358)	54,475	(11,661)	1,21,606
Balance, beginning of month	72,500	96,340	1,21,330	1,55,650	1,51,292	2,05,767	1,94,106
Balance, end of month	96,340	1,21,330	1,55,650	1,51,292	2,05,767	1,94,106	3,15,712

Question – 62

Consider the balance sheet of Maya Limited at December 31 (in thousands). The company has received a large order and anticipates the need to go to its bank to increase its borrowings. As a result, it has to forecast its cash requirements for January, February and March. Typically, the company

collects 20 per cent of its sales in the month of sale, 70 per cent in the subsequent month, and 10 per cent in the second month after the sale. All sales are credit sales.

	₹		₹
Cash	50	Accounts payable Bank	360
Accounts receivable	530	Bank loan	400
Inventories	545	Accruals	212
Current assets	1,125	Current liabilities	972
Net fixed assets	1,836	Long-term debt	450
		Common stock	100
		Retained earnings	1,439
Total assets	2,961	Total liabilities and equity	2,961

Purchases of raw materials are made in the month prior to the sale and amount to 60 per cent of sales in the subsequent month. Payments for these purchases occur in the month after the purchase. Labour costs, including overtime, are expected to be ₹ 1,50,000 in January, ₹ 2,00,000 in February, and ₹ 1,60,000 in March. Selling, administrative, taxes, and other cash expenses are expected to be ₹ 1,00,000 per month for January through March. Actual sales in November and December and projected sales for January through April are as follows (in thousands):

	₹		₹		₹
November	500	January	600	March	650
December	600	February	1,000	April	750

On the basis of this information:

- Prepare a cash budget for the months of January, February, and March.
- Determine the amount of additional bank borrowings necessary to maintain a cash balance of ₹ 50,000 at all times.
- Prepare a pro forma balance sheet for March 31.

(Study Material ICAI TYK – 10)

Solution:

A. Cash Budget

(in thousands)

	Nov.	Dec.	Jan.	Feb.	Mar.
	₹	₹	₹	₹	₹
Opening Balance (A)			50	50	50
Sales	500	600	600	1,000	650
Receipts:					
Collections, current month's sales			120	200	130
Collections, previous month's sales			420	420	700
Collections, previous 2 month's sales			50	60	60
Total (B)			590	680	890
Purchases		360	600	390	450
Payments:					
Payment for purchases			360	600	390
Labour costs			150	200	160
Other expenses			100	100	100
Total (C)			610	900	650
Surplus/Deficit (D) = (A + B - C)			30	(170)	290
Minimum cash balance (E)			50	50	50
Additional borrowings (F) = (E - D)			20	220	(240)

	Jan. ₹	Feb. ₹	Mar. ₹
Additional Borrowing	20	220	(240)
Cumulative Borrowing	420	640	400

The amount of financing peaks in February owing to the need to pay for purchases made the previous month and higher labour costs. In March, substantial collections are made on the prior month's billings, causing large net cash inflow sufficient to pay off the additional borrowings.

B. Pro Forma Balance Sheet, March 31 (in thousands)

Equity & liabilities	Amount (₹ in '000)	Assets	Amount (₹ in '000)
Equity shares capital	100	Net fixed assets	1,836
Retained earnings	1,529	Inventories	635
Long-term borrowings	450	Accounts receivables	620
Accounts payables	450	Cash and bank	50
Loan from banks	400		
Other liabilities	212		

	3,141		3,141
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Accounts receivable = Sales in March $\times$ 0.8 + Sales in February $\times$ 0.1

$$= ₹ 650 \times 0.8 + ₹ 1,000 \times 0.1 = ₹ 620$$

Inventories = ₹ 545 + Total purchases from January to March –
Total sales from January to March $\times$ 0.6

$$= ₹ 545 + (₹ 600 + ₹ 390 + ₹ 450) - (₹ 600 + ₹ 1000 + ₹ 650) \times 0.6 = ₹ 635$$

Accounts payable = Purchases in March = ₹ 450

Retained earnings = ₹ 1,439 + Sales – Payment for purchases – Labour costs and – Other expenses, all for January to March

$$= ₹ 1,439 + (₹ 600 + ₹ 1000 + ₹ 650) - (₹ 360 + ₹ 600 + ₹ 390) - (₹ 150 + ₹ 200 + ₹ 160) - (₹ 100 + ₹ 100 + ₹ 100) = ₹ 1,529$$

Question – 63

A company was incorporated w.e.f. 1st April, 2021. Its authorized capital was ₹ 1,00,00,000 divided into 10 lakh equity shares of ₹10 each. It intends to raise capital by issuing equity shares of ₹ 50,00,000 (fully paid) on 1st April. Besides this, a loan of ₹ 6,50,000 @ 12% per annum will be obtained from a financial institution on 1st April and further borrowings will be made at same rate of interest on the first day of the month in which borrowing is required. All borrowings will be repaid along with interest on the expiry of one year. The company will make payment for the following assets in April.

Particulars	(₹)
Plant and Machinery	10,00,000
Land and Building	20,00,000
Furniture	5,00,000
Motor Vehicles	5,00,000
Stock of Raw Materials	5,00,000

The following further details are available:

- (1) Projected Sales (April-September):

	(₹)
April	15,00,000
May	17,50,000
June	17,50,000
July	20,00,000
August	20,00,000
September	22,50,000

- (2) Gross profit margin will be 25% on sales.
- (3) The company will make credit sales only and these will be collected in the second month following sales.
- (4) Creditors will be paid in the first month following credit purchases. There will be credit purchases only.
- (5) The company will keep minimum stock of raw materials of ₹ 5,00,000.
- (6) Depreciation will be charged @ 10% per annum on cost on all fixed assets.
- (7) Payment of miscellaneous expenses of ₹ 50,000 will be made in April.
- (8) Wages and salaries will be ₹ 1,00,000 each month and will be paid on the first day of the next month.
- (9) Administrative expenses of ₹ 50,000 per month will be paid in the month of their incurrence.
- (10) No minimum cash balance is required.

You are required to PREPARE the monthly cash budget (April-September), the projected Income Statement for the 6 months period and the projected Balance Sheet as on 30th September, 2021.

(RTP Nov – 2022)

Solution:

Monthly Cash Budget (April-September)

(₹)

	Apr	May	Jun	Jul	Aug	Sep
Opening cash balance	-	10,50,000	-	1,37,500	5,25,000	7,25,000
A. Cash						

inflows						
Equity shares	50,00,000	-	-	-	-	-
Loans (Refer to working note 1)	6,50,000	1,25,000	-	-	-	-
Receipt from debtors	-	-	<u>15,00,000</u>	<u>17,50,000</u>	<u>17,50,000</u>	<u>20,00,000</u>
Total (A)	<u>56,50,000</u>	<u>11,75,000</u>	<u>15,00,000</u>	<u>18,87,500</u>	<u>22,75,000</u>	<u>27,25,000</u>
B. Cash Outflows						
Plant and Machinery	10,00,000	-	-	-	-	-
Land and Building	20,00,000	-	-	-	-	-
Furniture	5,00,000	-	-	-	-	-
Motor Vehicles	5,00,000	-	-	-	-	-
Stock of raw materials (Minimum stock)	5,00,000	-	-	-	-	-
Miscellaneous expenses	50,000	-	-	-	-	-
Payment to creditors for credit purchases (Refer to working note 2)	-	10,25,000	12,12,500	12,12,500	14,00,000	14,00,000
Wages and salaries	-	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000
Admn. expenses	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>
Total : (B)	<u>46,00,000</u>	<u>11,75,000</u>	<u>13,62,500</u>	<u>13,62,500</u>	<u>15,50,000</u>	<u>15,50,000</u>
Closing balance (A)-(B)	10,50,000	-	1,37,500	5,25,000	7,25,000	11,75,000

Budgeted Income Statement for six-month period ending 30th September

Particulars	(₹)	Particulars	(₹)
To Purchases	83,37,500	By Sales	1,12,50,000
To Wages and Salaries	6,00,000	By Closing stock	5,00,000
To Gross profit c/d	28,12,500		
	1,17,50,000		1,17,50,000
To Admn. expenses	3,00,000	By Gross profit b/d	28,12,500
To Depreciation (10% on ₹ 40 lakhs for six months)	2,00,000		
To Accrued interest on loan (Refer to working note 3)	45,250		
To Miscellaneous expenses To	50,000		
Net profit c/d	22,17,250		
	28,12,500		28,12,500

Projected Balance Sheet as on 30th September, 2021

Liabilities		Amount (₹)	Assets			Amount (₹)
Share Capital:			Fixed Assets:			
Authorized capital 10,00,000 equity shares of ₹ 10 each		1,00,00,000	Land and Building	20,00,000		
Issued, subscribed and paid up capital 5,00,000 equity shares of ₹ 10 each		50,00,000	Less: Depreciation	1,00,000	19,00,000	
Reserve and Surplus:			Plant and Machinery	10,00,000		
Profit and Loss		22,17,250	Less: Depreciation	50,000	9,50,000	
Long-term loans		7,75,000	Furniture	5,00,000		
Current liabilities and provisions:			Less: Depreciation	25,000	4,75,000	38,00,000
			Motor Vehicles	5,00,000		
			Less: Depreciation	25,000	4,75,000	
			Current Assets:			
Sundry creditors	15,87,500		Stock		5,00,000	

Accrued interest	45,250		Sundry debtors	42,50,000	
Outstanding	<u>1,00,000</u>		Cash	<u>11,75,000</u>	59,25,000
expenses		<u>17,32,750</u>			<u>97,75,000</u>
		97,75,000			

Working Notes:

Subsequent Borrowings Needed

	Apr	May	Jun	Jul	Aug	Sep
A. Cash Inflow						
Equity shares	50,00,000					
Loans	6,50,000					
Receipt from debtors	-	-	15,00,000	17,50,000	17,50,000	20,00,000
Total (A)	56,50,000	-	15,00,000	17,50,000	17,50,000	20,00,000
B. Cash Outflow						
Purchase of fixed assets	40,00,000					
Stock	5,00,000					
Miscellaneous expenses	50,000					
Payment to creditors	-	10,25,000	12,12,500	12,12,500	14,00,000	14,00,000
Wages and salaries	-	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000
expenses	50,000	50,000	50,000	50,000	50,000	50,000
Total	46,00,000	11,75,000	13,62,500	13,62,500	15,50,000	15,50,000
Surplus/ (Deficit)	10,50,000	(11,75,000)	1,37,500	3,87,500	2,00,000	4,50,000
Cumulative balance	10,50,000	(1,25,000)	12,500	4,00,000	6,00,000	10,50,000

1. There is shortage of cash in May of ₹ 1,25,000 which will be met by borrowings in May.
2. Payment to Creditors

Purchases = Cost of goods sold - Wages and salaries

Purchases for April = (75% of 15,00,000) - ₹ 1,00,000 = ₹ 10,25,000

(Note: Since gross margin is 25% of sales, cost of manufacture i.e. materials plus wages and salaries should be 75% of sales)

Hence, Purchases = Cost of manufacture minus wages and salaries of ₹ 1,00,000)

The creditors are paid in the first month following purchases.

Therefore, payment in May is ₹ 10,25,000

The same procedure will be followed for other months.

April (75% of 15,00,000) - ₹ 1,00,000 = ₹ 10,25,000

May (75% of 17,50,000) - ₹ 1,00,000 = ₹ 12,12,500

June (75% of 17,50,000) - ₹ 1,00,000 = ₹ 12,12,500

July (75% of 20,00,000) - ₹ 1,00,000 = ₹ 14,00,000

August (75% of 20,00,000) - ₹ 1,00,000 = ₹ 14,00,000

September (75% of 22,50,000) - ₹ 1,00,000 = ₹ 15,87,500

Minimum Stock ₹ 5,00,000

Total Purchases ₹ 83,37,500

3. Accrued Interest on Loan

12% interest on ₹ 6,50,000 for 6 months 39,000

Add: 12% interest on ₹ 1,25,000 for 5 months 6,250

45,250

Question – 64

A garment trader is preparing cash forecast for first three months of calendar year 2021. His estimated sales for the forecasted periods are as below:

	January (₹ '000)	February (₹ '000)	March (₹ '000)
Total sales	600	600	800

- (i) The trader sells directly to public against cash payments and to other entities on credit. Credit sales are expected to be four times the value of direct sales to public. He expects 15% customers to pay in the month in which credit sales are made, 25% to pay in the next month and 58% to pay in the next to next month. The outstanding balance is expected to be written off.

- (ii) Purchases of goods are made in the month prior to sales and it amounts to 90% of sales and are made on credit. Payments of these occur in the month after the purchase. No inventories of goods are held.
- (iii) Cash balance as on 1st January, 2021 is ₹ 50,000.
- (iv) Actual sales for the last two months of calendar year 2020 are as below:

	November (₹'000)	December (₹ '000)
Total sales	640	880

You are required to prepare a monthly cash, budget for the three months from January to March, 2021.

(Exam, Dec – 2021)

Solution:

Working Notes:

(1) Calculation of cash and credit sales (₹ in thousands)

	Nov.	Dec.	Jan.	Feb.	Mar.
Total Sales	640	880	600	600	800
Cash Sales (1/5 th of total sales)	128	176	120	120	160
Credit Sales (4/5 th of total sales)	512	704	480	480	640

(2) Calculation of Credit Sales Receipts

Month	Nov.	Dec.	Jan.	Feb.	Mar.
Forecast Credit sales (Working note 1)	512.00	704.00	480.00	480.00	640.00
Receipts:					
15% in the month of sales			72.00	72.00	96.00
25% in next month			176.00	120.00	120.00
58% in next to next month			296.96	408.32	278.40
Total			544.96	600.32	494.40

Cash Budget

(₹ in thousands)

	Nov.	Dec.	Jan.	Feb.	Mar.
Opening Balance (A)			50.00	174.96	355.28
Sales	640.00	880.00	600.00	600.00	800.00

Receipts:					
Cash Collection (Working note 1)			120.00	120.00	160.00
Credit Collections (Working note 2)			544.96	600.32	494.40
Total (B)			664.96	720.32	654.40
Purchases (90% of sales in the month prior to sales)		540	540	720	
Payments:					
Payment for purchases (next month)			540	540	720
Total (C)			540	540	720
Closing balance (D) = (A + B - C)			174.96	355.28	289.68

Question – 65

Slide Ltd. is preparing a cash flow forecast for the three month period from January to the end of March. The following sales volumes have been forecasted :

	December	January	February	March	April
Sales (units)	1800	1875	1950	2100	2250

Selling price per unit ₹ 600. Sales are all on one month credit. Production of goods for sale takes place one month before sales. Each Unit produced requires two units of raw material costing ₹ 150 per unit. No raw material inventory is held. Raw materials purchases are on one month credit. Variable overheads and wages equal to ₹ 100 per unit are incurred during production and paid in the month of production. The opening cash balance on 1st January is expected to be ₹ 35,000. A long term loan of ₹ 2,00,000 is expected to be received in the month of March. A machine costing ₹ 3,00,000 will be purchased in March.

- Prepare a cash budget for the months of January, February and March and calculate the cash balance at the end of each month in the three months period.
- Calculate the forecast current ratio at the end of the three months period.

(Exam, Nov – 2019)

Solution:**Working Notes:**

(1) Calculation of Collection from Trade Receivables:

Particulars	December	January	February	March
Sales (units)	1,800	1,875	1,950	2,100
Sales (@ ₹ 600 per unit) / Trade Receivables (Debtors) (₹)	10,80,000	11,25,000	11,70,000	12,60,000
Collection from Trade Receivables (Debtors) (₹)		10,80,000	11,25,000	11,70,000

(2) Calculation of Payment to Trade Payables:

Particulars	December	January	February	March
Output (units)	1,875	1,950	2,100	2,250
Raw Material (2 units per output) (units)	3,750	3,900	4,200	4,500
Raw Material (@ ₹ 150 per unit) / Trade Payables (Creditors) (₹)	5,62,500	5,85,000	6,30,000	6,75,000
Payment to Trade Payables (Creditors) (₹)		5,62,500	5,85,000	6,30,000

(3) Calculation of Variable Overheads and Wages:

Particulars	January	February	March
Output (units)	1,950	2,100	2,250
Payment in the same month @ ₹ 100 per unit (₹)	1,95,000	2,10,000	2,25,000

(a) Preparation of Cash Budget

Particulars	January (₹)	February (₹)	March (₹)
Opening Balance	35,000	3,57,500	6,87,500
Receipts:			
Collection from Trade Receivables (Debtors)	10,80,000	11,25,000	11,70,000
Receipt of Long-Term Loan			2,00,000
Total (A)	11,15,000	14,82,500	20,57,500
Payments:			
Trade Payables (Creditors) for Materials	5,62,500	5,85,000	6,30,000

Variable Overheads and Wages	1,95,000	2,10,000	2,25,000
Purchase of Machinery			3,00,000
Total (B)	7,57,500	7,95,000	11,55,000
Closing Balance (A – B)	3,57,500	6,87,500	9,02,500

(b) Calculation of Current Ratio

Particulars	March (₹)
Output Inventory (i.e. units produced in March) [(2,250 units × 2 units of raw material per unit of output × ₹ 150 per unit of raw material) + 2,250 units × ₹ 100 for variable overheads and wages] or, [6,75,000 + 2,25,000] from Working Notes 2 and 3	9,00,000
Trade Receivables (Debtors)	12,60,000
Cash Balance	9,02,500
Current Assets	30,62,500
Trade Payables (Creditors)	6,75,000
Current Liabilities	6,75,000
Current Ratio (Current Assets/Current Liabilities)	4.537 approx.

Question – 66

K Ltd. has a Quarterly cash outflow of ₹ 9,00,000 arising uniformly during the Quarter. The company has an Investment portfolio of Marketable Securities. It plans to meet the demands for cash by periodically selling marketable securities. The marketable securities are generating a return of 12% p.a. Transaction cost of converting investments to cash is ₹ 60. The company uses Baumol model to find out the optimal transaction size for converting marketable securities into cash.

Consider 360 days in a year.

You are required to calculate

- Company's average cash balance,
- Number of conversions each year and
- Time interval between two conversions.

(Exam, Nov – 2022)

Solution:

(i) Computation of Average Cash balance:

$$\text{Annual cash outflow (U)} = 9,00,000 \times 4 = ₹ 36,00,000$$

$$\text{Fixed cost per transaction (P)} = ₹ 60$$

$$\text{Opportunity cost of one rupee p.a. (S)} = \frac{12}{100} = 0.12$$

$$\text{Optimum cash balance (C)} = \sqrt{\frac{2UP}{S}} = \sqrt{\frac{2 \times 36,00,000 \times 60}{0.12}} = ₹ 60,000$$

$$\therefore \text{Average Cash balance} = \frac{(0 + 60,000)}{2} = ₹ 30,000$$

(ii) Number of conversions p.a.

$$\text{Annual cash outflow} = ₹ 36,00,000$$

$$\text{Optimum cash balance} = ₹ 60,000$$

$$\therefore \text{No. of conversions p.a} = \frac{36,00,000}{60,000} = 60$$

(iii) Time interval between two conversions

$$\text{No. of days in a year} = 360$$

$$\text{No. of conversions p.a.} = 60$$

$$\therefore \text{No. of conversions p.a} = \frac{360}{60} = 6 \text{ days}$$

Question – 67

You are given the following information:

Estimated monthly Sales are as follows:

	₹		₹
January	5,50,000	June	4,40,000
February	6,60,000	July	5,50,000
March	7,70,000	August	4,40,000
April	4,40,000	September	3,30,000
May	3,30,000	October	5,50,000

- (i) Wages and Salaries are estimated to be payable as follows:

	₹		₹
April	49,500	July	55,000
May	44,000	August	49,500
June	55,000	September	49,500

- (iii) Of the sales, 75% is on credit and 25% for cash. 60% of the credit sales are collected within one month and the balance in two months. There are no bad debt losses.
- (iv) Purchases amount to 75% of sales and are made and paid for in the month preceding the sales.
- (v) The firm has taken a loan of ₹ 6,00,000. Interest @ 12% p.a. has to be paid quarterly in January, April and so on.
- (vi) The firm is to make payment of tax of ₹26,000 in July 2023.
- (vii) The firm had a cash balance of ₹ 35,000 on 1st April 2023 which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary investments/liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).

Required:

PREPARE monthly cash budgets for six months beginning from April, 2023 on the basis of the above information.

(MTP March – 2023)

Solution:

Computation – Collections from Customers

Particulars	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Total Sales	6,60,000	7,70,000	4,40,000	3,30,000	4,40,000	5,50,000	4,40,000	3,30,000
Credit Sales (75% of total Sales)	4,95,000	5,77,500	3,30,000	2,47,500	3,30,000	4,12,500	3,30,000	2,47,500
Collection (within one month)		2,97,000	3,46,500	1,98,000	1,48,500	1,98,000	2,47,500	1,98,000
Collection (within two months)			1,98,000	2,31,000	1,32,000	99,000	1,32,000	1,65,000

months)								
Total Collections			5,44,500	4,29,000	2,80,500	2,97,000	3,79,500	3,63,000

Monthly Cash Budget for Six Months: April to September 2023

Particulars	April	May	June	July	August	Sept.
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Receipts:						
Opening Balance	35,000	35,000	35,000	35,000	35,000	35,000
Cash Sales	1,10,000	82,500	1,10,000	1,37,500	1,10,000	82,500
Collections from Debtors	5,44,500	4,29,000	2,80,500	2,97,000	3,79,500	3,63,000
Total Receipts (A)	6,89,500	5,46,500	4,25,500	4,69,500	5,24,500	4,80,500
Payments:						
Purchases	2,47,500	3,30,000	4,12,500	3,30,000	2,47,500	4,12,500
Wages and Salaries	49,500	44,000	55,000	55,000	49,500	49,500
Interest on Loan	18,000	-----	-----	18,000	-----	-----
Tax Payment	-----	-----	-----	26,000	-----	-----
Total Payment (B)	3,15,000	3,74,000	4,67,500	4,29,000	2,97,000	4,62,000
Minimum Cash Balance	35,000	35,000	35,000	35,000	35,000	35,000
Total Cash Required (C)	3,50,000	4,09,000	5,02,500	4,64,000	3,32,000	4,97,000
Surplus/ (Deficit) (A)-(C)	3,39,500	1,37,500	-77,000	5,500	1,92,500	-16,500
Investment/Financing:						
Total effect of (Invest)/Financing (D)	-3,39,500	-1,37,500	77,000	-5,500	-1,92,500	16,500
Closing Cash Balance (A) + (D) - (B)	35,000	35,000	35,000	35,000	35,000	35,000

Question – 68

PREPARE monthly cash budget for the first six months of 2021 on the basis of the following information:

- (i) Actual and estimated monthly sales are as follows:

Actual	(₹)	Estimated	(₹)
October 2020	2,00,000	January 2021	60,000
November 2020	2,20,000	February 2021	80,000
December 2020	2,40,000	March 2021	1,00,000
		April 2021	1,20,000
		May 2021	80,000
		June 2021	60,000
		July 2021	1,20,000

- (ii) Operating Expenses (including salary & wages) are estimated to be payable as follows:

Month	(₹)	Month	(₹)
January 2021	22,000	April 2021	30,000
February 2021	25,000	May 2021	25,000
March 2021	30,000	June 2021	24,000

- (iii) Of the sales, 75% is on credit and 25% for cash. 60% of the credit sales are collected after one month, 30% after two months and 10% after three months.
- (iv) Purchases amount to 80% of sales and are made on credit and paid for in the month preceding the sales.
- (v) The firm has 12% debentures of ₹ 1,00,000. Interest on these has to be paid quarterly in January, April and so on.
- (vi) The firm is to make an advance payment of tax of ₹ 5,000 in April.
- (vii) The firm had a cash balance of ₹ 40,000 at 31st Dec. 2020, which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary investments/liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).

(MTP March – 2021)

Solution:

Monthly Cash Budget for first six months of 2021

(Amount in ₹)

Particulars	Jan.	Feb.	Mar.	April.	May.	June.
Opening balance	40,000	40,000	40,000	40,000	40,000	40,000
Receipts:						
Cash sales	15,000	20,000	25,000	30,000	20,000	15,000
Collection from debtors	1,72,500	97,500	67,500	67,500	82,500	70,500
Total cash available (A)	2,27,500	1,57,500	1,32,500	1,37,500	1,42,500	1,25,500
Payments:						
Purchases	64,000	80,000	96,000	64,000	48,000	96,000
Operating Expenses	22,000	25,000	30,000	30,000	25,000	24,000
Interest on debentures	3,000	-	-	3,000	-	-
Tax payment	-	-	-	5,000	-	-
Total payments (B)	89,000	1,05,000	1,26,000	1,02,000	73,000	1,20,000
Minimum cash balance desired	40,000	40,000	40,000	40,000	40,000	40,000

Total cash needed (C)	1,29,000	1,45,000	1,66,000	1,42,000	1,13,000	1,60,000
Surplus/(deficit) (A -C)	98,500	12,500	(33,500)	(4,500)	29,500	(34,500)
Investment/financing						
Temporary Investments						
Liquidation of temporary investments or temporary borrowings	(98,500)	(12,500)	- 33,500	- 4,500	(29,500)	- 34,500
Total effect of investment/financing(D)	(98,500)	(12,500)	33,500	4,500	(29,500)	34,500
Closing cash balance (A + D- B)	40,000	40,000	40,000	40,000	40,000	40,000

Workings:**1. Collection from debtors:****(Amount in ₹)**

	Year 2020			Year 2021					
	Oct.	Nov.	Dec.	Jan.	Feb	Mar.	April	May	June
Total sales	2,00,000	2,20,000	2,40,000	60,000	80,000	1,00,000	1,20,000	80,000	60,000
Credit sales (75% of total sales)	1,50,000	1,65,000	1,80,000	45,000	60,000	75,000	90,000	60,000	45,000
Collections:									
One month		90,000	99,000	1,08,000	27,000	36,000	45,000	54,000	36,000
Two months			45,000	49,500	54,000	13,500	18,000	22,500	27,000
Three months				15,000	16,500	18,000	4,500	6,000	7,500
Total collections				1,72,500	97,500	67,500	67,500	82,500	70,500

2. Payment to Creditors:**(Amount in ₹)**

	Year 2021						
	Jan	Feb	Mar	Apr	May	Jun	Jul
Total sales	60,000	80,000	1,00,000	1,20,000	80,000	60,000	1,20,000
Purchases (80% of total sales)	48,000	64,000	80,000	96,000	64,000	48,000	96,000
Payment One Month Prior	64,000	80,000	96,000	64,000	48,000	96,000	

(5) INVENTORY MANAGEMENT**Question – 69**

A Company requires 36,000 units of a product per year at cost of ₹ 100 per unit. Ordering cost per order is ₹ 250 and the carrying cost is 4.5% per year of the inventory cost. Normal lead time is 25 days and safety.

Stock is NIL.

Assume 360 working days in a year.

- (i) Calculate the Reorder Inventory Level.
- (ii) Calculate the economic order Quantity (EOQ).
- (iii) If the supplier offers 1% Quantity discount for purchase in lots of 9,000 units or more, should the company accept the proposal ?

(Exam, May – 2022)

Solution:

Annual Consumption = 36,000 (A)

Ordering Cost = 250 per order (O)

Carrying Cost = $\frac{4.5}{100} \times 100 = 4.5$ (C)

Lead Time = 25 days

(i) **Reorder Level** = Lead Time $\times$ Daily Consumption

$$= 25 \times \frac{36,000}{360}$$

= 2,500 units

(ii) **Economic Order Quantity (EOQ)** = $\sqrt{\frac{2AO}{C}}$

$$= \sqrt{\frac{2 \times 36,000 \times 250}{4.5}}$$

= 2,000 units

(iii) **Evaluation of Profitability of Quantity Discount Offer:**

(a) **When EOQ is ordered**

		(₹)
Purchase Cost	(36,000 units $\times$ 100)	36,00,000
Ordering Cost	[(36,000 units / 2,000 units) $\times$ 250]	4,500
Carrying Cost	(2,000 units $\times$ $\frac{1}{2} \times 4.5$)	4,500

Total Cost	36,09,000
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(b) When Quantity Discount is accepted

		(₹)
Purchase Cost	(36,000 units × ₹ 99*)	35,64,000
Ordering Cost	[(36,000 units/9,000 units) × ₹250]	1,000
Carrying Cost	(9,000 units × ½ × ₹ 99 × 4.5%)	20,048
Total Cost		35,85,048

*Unit Cost = ₹100

Less: Quantity Discount @ 1% = ₹ 1

Purchase Cost = ₹ 99

Advise – The total cost of inventory is lower if Quantity Discount is accepted. Hence, the company is advised to accept the proposal.

(6) RESIDUAL**Question – 70**

A firm has the following data for the year ending 31st March, 2017:

	(₹)
Sales (1,00,000 @ ₹ 20)	20,00,000
Earnings before Interest and Taxes	2,00,000
Fixed Assets	5,00,000

The three possible current assets holdings of the firm are ₹ 5,00,000, ₹ 4,00,000 and ₹ 3,00,000. It is assumed that fixed assets level is constant and profits do not vary with current assets levels. So, the effect of the three alternative current assets policies.

(Study Material ICAI Illus – 01)

Solution:

	Conservative (₹)	Moderate (₹)	Aggressive (₹)
Sales	20,00,000	20,00,000	20,00,000
Earnings before Interest and Taxes (EBIT)	2,00,000	2,00,000	2,00,000
Current Assets	5,00,000	4,00,000	3,00,000

Fixed Assets	5,00,000	5,00,000	5,00,000
Total Assets	10,00,000	9,00,000	8,00,000
Return on Total Assets (EBIT ÷ Total Assets)	20%	22.22%	25%
Current Assets/Fixed Assets	1.00	0.80	0.60

The aforesaid calculation shows that the conservative policy provides greater liquidity (solvency) to the firm, but lower return on total assets. On the other hand, the aggressive policy gives higher return, but low liquidity and thus is very risky. The moderate policy generates return higher than Conservative policy but lower than aggressive policy. This is less risky than aggressive policy but riskier than conservative policy. It also reflects inverse relationship between Current Assets / Fixed Assets ratio and Return on Total Assets.

In determining the optimum level of current assets, the firm should balance the profitability – solvency tangle by minimizing total costs – Cost of liquidity and cost of illiquidity.

Question – 71

Suppose ABC Ltd. has been offered credit terms from its major supplier of 2/10, net 45. Hence the company has the choice of paying ₹ 10 per ₹ 100 or to invest ₹ 98 for an additional 35 days and eventually pay the supplier ₹ 100 per ₹ 100. The decision as to whether the discount should be accepted depends on the opportunity cost of investing ₹ 98 for 35 days. What should the company do?

(Study Material ICAI Illus – 17)

Solution:

If the company does not avail the cash discount and pays the amount after 45 days, the implied cost of interest per annum would be approximately.

$$\left(\frac{100}{100 - 2} \right)^{\frac{365}{35}} - 1 = 23.5\%$$

Now let us assume the ABC Ltd. can invest the additional cash and can obtain an annual return of 25% and if the amount of invoice is ₹ 10,000. The alternatives are as follows:

	Refuse Discount	Accept Discount
	₹	₹
Payment to supplier	10,000	9,800
Return from investing ₹ 9,800 between day 10 and day 45: $\frac{35}{365} \times ₹ 9,800 \times 25\%$	(235)	
Net Cost	9,765	9,800

Advise: Thus it is better for the company to refuse the discount, as return on cash retained is more than the saving on account of discount.

Question – 72

The Dolce Company purchases raw materials on terms of 2/10, net 30. A review of the company's records by the owner, Mr. Gautam, revealed that payments are usually made 15 days after purchases are made. When asked why the firm did not take advantage of its discounts, the accountant, Mr. Rohit, replied that it cost only 2 per cent for these funds, whereas a bank loan would cost the company 12 per cent.

- ANALYSE what mistake is Rohit making?
- If the firm could not borrow from the bank and was forced to resort to the use of trade credit funds, what suggestion might be made to Rohit that would reduce the annual interest cost? **IDENTIFY**.

(Study Material ICAI Illus – 18)

Solution:

- Rohit's argument of comparing 2% discount with 12% bank loan rate is not rational as 2% discount can be earned by making payment 5 days in advance i.e. within 10 days rather 15 days as payments are made presently. Whereas 12% bank loan rate is for a year.

Assume that the purchase value is ₹ 100, the discount can be earned by making payment within 10 days is ₹ 2, therefore, net payment would be ₹ 98 only. Annualized benefit

$$= \frac{₹ 2}{₹ 98} \times \frac{365 \text{ days}}{5 \text{ days}} \times 100 = 149\%$$

This means cost of not taking cash discount is 149%.

- (b) If the bank loan facility could not be available, then in this case the company should resort to utilize maximum credit period as possible.

Therefore, payment should be made in 30 days to reduce the interest cost.

Question – 73

Jensen and spencer pharmaceutical is in the business of manufacturing pharmaceutical drugs including the newly invented Covid vaccine. Due to increase in demand of Covid vaccines, the production had increased at all time high level and the company urgently needs a loan to meet the cash and investment requirements. It had already submitted a detailed loan proposal and project report to Expo-Impo bank, along with the financial statements of previous three years as follows:

STATEMENT OF PROFIT AND LOSS

(In ₹'000)

	2018-19	2019-20	2020-21
Sales			
Cash	400	960	1,600
Credit	3,600	8,640	14,400
Total sales	4,000	9,600	16,000
Cost of goods sold	2,480	5,664	9,600
Gross profit	1,520	3,936	6,400
Operating expenses:			
General, administration, and selling expenses	160	900	2,000
Depreciation	200	800	1,320
Interest expenses (on borrowings)	120	316	680
Profit before tax (PBT)	1,040	1,920	2,400
Tax @ 30%	312	576	720
Profit after tax (PAT)	728	1,344	1,680

BALANCE SHEET

(In ₹'000)

	2018-19	2019-20	2020-21
Assets			
Non-Current Assets			
Fixed assets (net of depreciation)	3,800	5,000	9,400
Current Assets			
Cash and cash equivalents	80	200	212
Accounts receivable	600	3,000	4,200

Inventories	640	3,000	4,500
Total	5,120	11,200	18,312
Equity & Liabilities			
Equity share capital (shares of ₹10 each)	2,400	3,200	4,000
Other Equity	728	2,072	3,752
Non-Current borrowings	1,472	2,472	5,000
Current liabilities	520	3,456	5,560
Total	5,120	11,200	18,312

INDUSTRY AVERAGE OF KEY RATIOS

Ratio	Sector Average
Current ratio	2.30:1
Acid test ratio (quick ratio)	1.20:1
Receivable turnover ratio	7 times
Inventory turnover ratio	4.85 times
Long-term debt to total debt	24%
Debt-to-equity ratio	35%
Net profit ratio	18%
Return on total assets	10%
Interest coverage ratio (times interest earned)	10

As a loan officer of Expo-Impo Bank, you are REQUIRED to apprise the loan proposal on the basis of comparison with industry average of key ratios considering closing balance for accounts receivable of ₹ 6,00,000 and inventories of ₹ 6,40,000 respectively as on 31st March, 2018.

(MTP Nov – 2021)

Solution:

(In ₹ '000)

Ratio	Formula	2018-19	2019-20	2020-21	Industry Average
Current ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	$\frac{1,320}{520}$	$\frac{6,200}{3,456}$	$\frac{8,912}{5,560}$	2.30:1
		= 2.54	= 1.80	= 1.60	
Acid test ratio (quick ratio)	$\frac{\text{Quick Assets}}{\text{Current Liabilities}}$	$\frac{680}{520} = 1.31$	$\frac{3,200}{3,456} = 0.93$	$\frac{4,212}{5,560} = 0.79$	1.20:1
Receivable turnover ratio	$\frac{\text{Credit Sales}}{\text{Average Accounts Receivable}}$	$\frac{3,600}{(600+600)/2} = 6$	$\frac{8,640}{(600+3,000)/2} = 4.80$	$\frac{14,400}{(3,000+4,200)/2} = 4$	7 times

Inventory turnover ratio	$\frac{\text{COGS}}{\text{Average Inventory}}$	$\frac{2,480}{(600+640)/2} = 3.88$	$\frac{5,664}{(640+3,000)/2} = 3.11$	$\frac{9,600}{(3,000 + 4,500)/2} = 2.56$	4.85 times
Long-term debt to total debt	$\frac{\text{Long term Debt}}{\text{Total Debt}} \times 100$	$\frac{1,472}{1,992} \times 100 = 73.90\%$	$\frac{2,472}{5,928} \times 100 = 41.70$	$\frac{5,000}{10,560} \times 100 = 47.35\%$	24 %
Debt-to-equity ratio	$\frac{\text{Long term Debt}}{\text{shareholders ' Equity}} \times 100$	$\frac{1,472}{3,128} \times 100 = 47.06\%$	$\frac{2,472}{5,272} \times 100 = 46.89\%$	$\frac{5,000}{7,752} \times 100 = 64.50\%$	35 %
Net profit ratio	$\frac{\text{Net profit}}{\text{Sales}} \times 100$	$\frac{728}{4,000} \times 100 = 18.2\%$	$\frac{1,344}{9,600} \times 100 = 14\%$	$\frac{1,680}{16,000} \times 100 = 10.5\%$	18%
Return on total assets	$\frac{\text{Net Profit After Tax}}{\text{Total Assets}} \times 100$	$\frac{728}{5,120} \times 100 = 14.22\%$	$\frac{1,344}{11,200} \times 100 = 12\%$	$\frac{1,680}{18,312} \times 100 = 9.17\%$	10%
Interest coverage ratio (times interest earned)	$\frac{\text{EBIT}}{\text{Interest}}$	$\frac{1,160}{120} = 9.67$	$\frac{2,236}{316} = 7.08$	$\frac{3,080}{680} = 4.53$	10

Conclusion:

In the last two years, the current ratio and quick ratio are less than the ideal ratio (2:1 and 1:1 respectively) indicating that the company is not having enough resources to meet its current obligations. Receivables are growing slower. Inventory turnover is slowing down as well, indicating a relative build-up in inventories or increased investment in stock. High Long-term debt to total debt ratio and Debt to equity ratio compared to that of industry average indicates high dependency on the industry norm. Additionally, though the Return on Total Asset (ROTA) is near to industry average, it is declining as well. The interest coverage ratio measures how many times a company can cover its current interest payment with its available earnings. A high interest coverage ratio means that an enterprise can easily meet its interest obligations, however, it is declining in the case of Jensen & Spencer and is also below the industry average indicating excessive use of debt or inefficient operations.

On overall comparison of the industry average of key ratios than that of Jensen & Spencer, the company is in deterioration position. The company's profitability has declined steadily over the period. However, before jumping to the conclusion relying only on the key ratios, it is pertinent to keep in mind the industry, the company dealing in with i.e. manufacturing of pharmaceutical drugs. The pharmaceutical industry is one of the major contributors to the

economy and is expected to grow further. After the covid situation, people are more cautious towards their health and are going to spend relatively more on health medicines. Thus, while analysing the loan proposal, both the factors, financial and non-financial, needs to be kept in mind.

Question – 74

A company is considering its working capital investment and financial policies for the next year. Estimated fixed assets and current liabilities for the next year are ₹ 2.60 crores and ₹ 2.34 crores respectively. Estimated Sales and EBIT depend on current assets investment, particularly inventories and book-debts. The Financial Controller of the company is examining the following alternative Working Capital Policies:

(₹ in crore)

Working Capital Policy	Investment in Current Assets	Estimated Sales	EBIT
Conservative	4.50	12.30	1.23
Moderate	3.90	11.50	1.15
Aggressive	2.60	10.00	1.00

After evaluating the working capital policy, the Financial Controller has advised the adoption of the moderate working capital policy. The company is now examining the use of long-term and short-term borrowings for financing its assets. The company will use ₹ 2.50 crores of the equity funds. The corporate tax rate is 35%. The company is considering the following debt alternatives.

(₹ in crore)

Financing Policy	Short-term Debt	Long-term Debt
Conservative	0.54	1.12
Moderate	1.00	0.66
Aggressive	1.50	0.16
Interest rate-Average	12%	16%

You are required to CALCULATE the following:

- (i) Working Capital Investment for each policy:
 - (a) Net Working Capital position
 - (b) Rate of Return
 - (c) Current ratio

- (ii) Financing for each policy:
- Net Working Capital position.
 - Rate of Return on Shareholders' equity.
 - Current ratio.

(RTP May – 2019)

Solution:

- (i) Statement showing Working Capital Investment for each policy

(₹ in crore)

	Working Capital Policy		
	Conservative	Moderate	Aggressive
Current Assets: (i)	4.50	3.90	2.60
Fixed Assets: (ii)	2.60	2.60	2.60
Total Assets: (iii)	7.10	6.50	5.20
Current liabilities: (iv)	2.34	2.34	2.34
Net Worth: (v) = (iii) - (iv)	4.76	4.16	2.86
Total liabilities: (iv) + (v)	7.10	6.50	5.20
Estimated Sales: (vi)	12.30	11.50	10.00
EBIT: (vii)	1.23	1.15	1.00
(a) Net working capital position: (i) - (iv)	2.16	1.56	0.26
(b) Rate of return: (vii) / (iii)	17.32%	17.69%	19.23%
(c) Current ratio: (i) / (iv)	1.92	1.67	1.11

- (ii) Statement Showing Effect of Alternative Financing Policy

(₹ in crore)

Financing Policy	Working Capital Policy		
	Conservative	Moderate	Aggressive
Current Assets (i)	3.90	3.90	3.90
Fixed Assets (ii)	2.60	2.60	2.60
Total Assets (iii)	6.50	6.50	6.50
Current Liabilities (iv)	2.34	2.34	2.34
Short term Debt (v)	0.54	1.00	1.50
Total current liabilities (vi) = (iv) + (v)	2.88	3.34	3.84
Long term Debt (vii)	1.12	0.66	0.16

Equity Capital (viii)	2.50	2.50	2.50
Total liabilities (ix) = (vi) + (vii) + (viii)	6.50	6.50	6.50
Forecasted Sales	11.50	11.50	11.50
EBIT (x)	1.15	1.15	1.15
Less: Interest on short-term debt (12% of ₹0.54)	0.06	0.12	0.18
Interest on long term debt (16% of ₹1.12)	0.18	0.11	0.03
Earnings before tax (EBT) (xi)	0.91	0.92	0.94
Taxes @ 35% (xii)	0.32	0.32	0.33
Earnings after tax: (xiii) = (xi) – (xii)	0.59	0.60	0.61
(a) Net Working Capital Position: (i) - [(iv) + (v)]	1.02	0.56	0.06
(b) Rate of return on shareholders Equity capital : (xiii) / (viii)	23.6%	24.0%	24.4%
(c) Current Ratio (i) / (vi)	1.35	1.17	1.02

Question – 75

Given below are the estimations for the next year by Niti Ltd.:

Particulars	(₹ in crores)
Fixed Assets	5.20
Current Liabilities	4.68
Current Assets	7.80
Sales	23.00
EBIT	2.30

The company will issue equity funds of ₹ 5 crores in the next year. It is also considering the debt alternatives of ₹ 3.32 crores for financing the assets. The company wants to adopt one of the policies given below:

(₹ in crores)

Financing Policy	Short term debt @ 12%	Long term debt @ 16%	Total
Conservative	1.08	2.24	3.32
Moderate	2.00	1.32	3.32
Aggressive	3.00	0.32	3.32

Assuming corporate tax rate at 30%, CALCULATE the following for each of the financing policy:

- (i) Return on total assets
- (ii) Return on owner's equity
- (iii) Net Working capital
- (iv) Current Ratio

Also advise which Financing policy should be adopted if the company wants high returns.

(RTP May – 2021)

Solution:

(i) Return on total assets

$$\begin{aligned}
 \text{Return on total assets} &= \frac{\text{EBIT}(1-T)}{\text{Total assets (FA + CA)}} \\
 &= \frac{\text{₹ 2.30 crores } (1 - 0.3)}{\text{₹ 5.20 crores} + \text{₹ 7.80 crores}} \\
 &= \frac{\text{₹ 1.61 crores}}{\text{₹ 13 crores}} = 0.1238 \text{ or } 12.38\%
 \end{aligned}$$

(ii) Return on owner's equity

(Amount in ₹)

	Financing policy (₹)		
	Conservative	Moderate	Aggressive
Expected EBIT	2,30,00,000	2,30,00,000	2,30,00,000
Less: Interest			
Short term Debt @ 12%	12,96,000	24,00,000	36,00,000
Long term Debt @ 16%	35,84,000	21,12,000	5,12,000
Earnings before tax (EBT)	1,81,20,000	1,84,88,000	1,88,88,000
Less: Tax @ 30%	54,36,000	55,46,400	56,66,400
Earnings after Tax (EAT)	1,26,84,000	1,29,41,600	1,32,21,600
Owner's Equity	5,00,00,000	5,00,00,000	5,00,00,000
Return on owner's equity	$= \frac{1,26,84,000}{5,00,00,000}$	$= \frac{1,29,41,600}{5,00,00,000}$	$= \frac{1,32,21,600}{5,00,00,000}$
Net Profit after taxes (EAT)			
$= \frac{\text{Owner's equity}}$	$= 0.2537 \text{ or } 25.37\%$	$= 0.2588 \text{ or } 25.88\%$	$= 0.2644 \text{ or } 26.44\%$

(iii) Net Working capital

(₹ in crores)

	Financing policy		
	Conservative	Moderate	Aggressive
Current Liabilities (Excluding Short Term Debt)	4.68	4.68	4.68
Short term Debt	1.08	2.00	3.00
Total Current Liabilities	5.76	6.68	7.68
Current Assets	7.80	7.80	7.80
Net Working capital = Current Assets – Current Liabilities	7.80 – 5.76 = 2.04	7.80 – 6.68 = 1.12	7.80 – 7.68 = 0.12

(iv) Current ratio

(₹ in crores)

	Financing policy		
	Conservative	Moderate	Aggressive
Current Ratio $\frac{\text{Current Assets}}{\text{Current Liabilities}}$	$\frac{7.80}{5.76} = 1.35$	$\frac{7.80}{6.68} = 1.17$	$\frac{7.80}{7.68} = 1.02$

Advise: It is advisable to adopt aggressive financial policy, if the company wants high return as the return on owner's equity is maximum in this policy i.e. 26.44%.

Question – 76

A company is considering its working capital investment and financial policies for the next year. Estimated fixed assets and current liabilities for the next year are ₹ 2.60 crores and ₹ 2.34 crores respectively. Estimated Sales and EBIT depend on current assets investment, particularly inventories and book-debts. The financial controller of the company is examining the following alternative Working Capital Policies:

(₹ Crores)

Working Capital Policy	Investment in Current Assets	Estimated Sales	EBIT
Conservative	4.50	12.30	1.23
Moderate	3.90	11.50	1.15

Aggressive	2.60	10.00	1.00
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After evaluating the working capital policy, the Financial Controller has advised the adoption of the moderate working capital policy. The company is now examining the use of long-term and short-term borrowings for financing its assets. The company will use ₹ 2.50 crores of the equity funds. The corporate tax rate is 35%. The company is considering the following debt alternatives.

(₹ Crores)

Financing Policy	Short-term Debt	Long-term Debt
Conservative	0.54	1.12
Moderate	1.00	0.66
Aggressive	1.50	0.16
Interest rate-Average	12%	16 %

You are required to CALCULATE the following:

- (i) Working Capital Investment for each policy:
 - (a) Net Working Capital position
 - (b) Rate of Return
 - (c) Current ratio
- (ii) Financing for each policy:
 - (a) Net Working Capital position.
 - (b) Rate of Return on Shareholders' equity.
 - (c) Current ratio.

(RTP Nov – 2018)

Solution:

- (i) Statement showing Working Capital for each policy**

(₹ in crores)

	Working Capital Policy		
	Conservative	Moderate	Aggressive
Current Assets: (i)	4.50	3.90	2.60
Fixed Assets: (ii)	2.60	2.60	2.60

Total Assets: (iii)	7.10	6.50	5.20
Current liabilities: (iv)	2.34	2.34	2.34
Net Worth: (v)=(iii)-(iv)	4.76	4.16	2.86
Total liabilities: (iv)+(v)	7.10	6.50	5.20
Estimated Sales: (vi)	12.30	11.50	10.00
EBIT: (vii)	1.23	1.15	1.00
(a) Net working capital position: (i)-(iv)	2.16	1.56	0.26
(b) Rate of return: (vii)/(iii)	17.3%	17.7%	19.2%
(c) Current ratio: (i)/(iv)	1.92	1.67	1.11

(ii) Statement Showing Effect of Alternative Financing Policy**(₹ in crores)**

Financing Policy	Conservative	Moderate	Aggressive
Current Assets: (i)	3.90	3.90	3.90
Fixed Assets: (ii)	2.60	2.60	2.60
Total Assets: (iii)	6.50	6.50	6.50
Current Liabilities: (iv)	2.34	2.34	2.34
Short term Debt: (v)	0.54	1.00	1.50
Long term Debt: (vi)	1.12	0.66	0.16
Equity Capital (vii)	2.50	2.50	2.50
Total liabilities	6.50	6.50	6.50
Forecasted Sales	11.50	11.50	11.50
EBIT: (viii)	1.15	1.15	1.15
Less: Interest short-term debt: (ix)	0.06 (12% of ₹ 0.54)	0.12 (12% of ₹ 1.00)	0.18 (12% of ₹ 1.50)
Long term debt: (x)	0.18 (16% of ₹ 1.12)	0.11 (16% of ₹ 0.66)	0.03 (16% of ₹ 0.16)
Earning before tax: (xi) - (ix + x)	0.91	0.92	0.94
Tax @ 35%	(0.32)	(0.32)	(0.33)
Earning after tax: (xii)	0.59	0.60	0.61
(a) Net Working Capital Position: (i) - [(iv)+(v)]	1.02	0.56	0.06
(b) Rate of return on Equity shareholders' capital : (xii)/(vii)	23.6%	24%	24.4%
(c) Current Ratio: [(i)/(iv)+(v)]	1.35	1.17	1.02

Multiple Choice Questions (MCQs)

1. Tiago Ltd is an all-equity company engaged in manufacturing of batteries for electric vehicles. There has been a surge in demand for their products due to rising oil prices. The company was established 5 years ago with an initial capital of ₹ 10,00,000 and since then it has raised funds by IPO taking the total paid up capital to ₹ 1 crore comprising of fully paid-up equity shares of face value ₹ 10 each. The company currently has undistributed reserves of ₹ 60,00,000. The company has been following constant dividend payout policy of 40% of earnings. The retained earnings by company are going to provide a return on equity of 20%. The current EPS is estimated as ₹ 20 and prevailing PE ratio on the share of company is 15x. The company wants to expand its capital base by raising additional funds by way of debt, preference and equity mix. The company requires an additional fund of ₹ 1,20,00,000. The target ratio of owned to borrowed funds is 4:1 post the fund-raising activity. Capital gearing is to be kept at 0.4x.

The existing debt markets are under pressure due to ongoing RBI action on NPAs of the commercial bank. Due to challenges in raising the debt funds, the company will have to offer ₹ 100 face value debentures at an attractive yield of 9.5% and a coupon rate of 8% to the investors. Issue expenses will amount to 4% of the proceeds.

The preference shares will have a face value of ₹ 1000 each offering a dividend rate of 10%. The preference shares will be issued at a premium of 5% and redeemed at a premium of 10% after 10 years at the same time at which debentures will be redeemed.

The CFO of the company is evaluating a new battery technology to invest the above raised money. The technology is expected to have a life of 7 years. It will generate a after tax marginal operating cash flow of ₹ 25,00,000 p.a. Assume marginal tax rate to be 27%.

(MTP April – 2024)

1. Which of the following is best estimate of cost of equity for Tiago Ltd?
- (a) 12.99%
- (b) 11.99%

- (c) 13.99%
- (d) 14.99%**
2. Which of the following is the most accurate measure of issue price of debentures?
- (a) 100
- (b) 96
- (c) 90.58**
- (d) 95.88
3. Which of the following is the best estimate of cost of debentures to be issued by the company? (Using approximation method)
- (a) 7.64%**
- (b) 6.74%
- (c) 4.64%
- (d) 5.78%
4. Calculate the cost of preference shares using approximation method
- (a) 10.23%
- (b) 11.22%**
- (c) 12.12%
- (d) 12.22%
5. Which of the following best represents the overall cost of marginal capital to be raised?
- (a) 11.76%**
- (b) 17.16%
- (c) 16.17%
- (d) 16.71%

2. Ranu & Co. has issued 10% debenture of face value 100 for ₹ 10 lakh. The debenture is expected to be sold at 5% discount. It will also involve floatation costs of ₹ 10 per debenture. The debentures are redeemable at a premium of 10% after 10 years. Calculate the cost of debenture if the tax rate is 30%.
- (a) **8.97%**
- (b) 9.56%
- (c) 8.25%
- (d) 10.12%
3. Given Data: Sales is ₹ 10,00,000, Break even sales is ₹ 6,00,000. What is the Degree of operating leverage?
- (a) 3
- (b) 2
- (c) **2.5**
- (d) 2.2
4. A project requires an initial investment of ₹ 20,000 and it would give annual cash inflow of ₹ 4,000. The useful life of the project is estimated to be 10 years. What is payback reciprocal/Approximated IRR?
- (a) **20%**
- (b) 15%
- (c) 25%
- (d) 12%
5. The credit terms may be expressed as “3/15 net 60”. This means that a 3% discount will be granted if the customer pays within 15 days, if he does not avail the offer, he must make payment within 60 days.
- (a) I agree with the statement
- (b) I do not agree with the statement
- (c) I cannot say.

- 6.** The term 'net 50' implies that the customer will make payment:
- (a) Exactly on 50th day
 - (b) Before 50th day
 - (c) Not later than 50th day
 - (d) None of the above.
- 7.** Trade credit is a source of :
- (a) Long-term finance
 - (b) Medium term finance
 - (c) Spontaneous source of finance
 - (d) None of the above.
- 8.** The term float is used in:
- (a) Inventory Management
 - (b) Receivable Management
 - (c) Cash Management
 - (d) Marketable securities.
- 9.** William J Baumol's model of Cash Management determines optimum cash level where the carrying cost and transaction cost are:
- (a) Maximum
 - (b) Minimum
 - (c) Medium
 - (d) None of the above.
- 10.** In Miller – ORR Model of Cash Management:
- (a) The lower, upper limit, and return point of Cash Balances are set out

- (b) Only upper limit and return point are decided
- (c) Only lower limit and return point are decided
- (d) None of the above are decided.

11. Working Capital is defined as:

- (a) Excess of current assets over current liabilities
- (b) Excess of current liabilities over current assets
- (c) Excess of Fixed Assets over long-term liabilities
- (d) None of the above.

12. Working Capital is also known as “Circulating Capital, fluctuating Capital and revolving capital”. The aforesaid statement is;

- (a) Correct
- (b) Incorrect
- (c) Cannot say.

13. The basic objectives of Working Capital Management are:

- (a) Optimum utilization of resources for profitability
- (b) To meet day-to-day current obligations
- (c) Ensuring marginal return on current assets is always more than cost of capital
- (d) Select any one of the above statements.

14. The term Gross Working Capital is known as:

- (a) The investment in current liabilities
- (b) The investment in long-term liability
- (c) The investment in current assets
- (d) None of the above.

- 15.** The term net working capital refers to the difference between the current assets minus current liabilities.
- (a) The statement is correct
 - (b) The statement is incorrect
 - (c) I cannot say.
- 16.** The term “Core current assets’ was coined by:
- (a) Chore Committee
 - (b) Tandon Committee
 - (c) Jilani Committee
 - (d) None of the above.
- 17.** The concept operating cycle refers to the average time which elapses between the acquisition of raw materials and the final cash realization. This statement is:
- (a) Correct
 - (b) Incorrect
 - (c) Partially True
 - (d) I cannot say.
- 18.** As a matter of self-imposed financial discipline can there be a situation of zero working capital now-a-days in some of the professionally managed organizations.
- (a) Yes
 - (b) No
 - (c) Impossible
 - (d) Cannot say.

- 19.** Over trading arises when a business expands beyond the level of funds available. The statement is:
- (a) Incorrect
 - (b) Correct
 - (c) Partially correct
 - (d) I cannot say.
- 20.** A Conservative Working Capital strategy calls for high levels of current assets in relation to sales.
- (a) I agree
 - (b) Do not agree
 - (c) I cannot say.
- 21.** The term Working Capital leverage refer to the impact of level of working capital on company's profitability. This measures the responsiveness of ROCE for changes in current assets.
- (a) I agree
 - (b) Do not agree
 - (c) The statement is partially true.
- 22.** The term spontaneous source of finance refers to the finance which naturally arise in the course of business operations. The statement is:
- (a) Correct
 - (b) Incorrect
 - (c) Partially Correct
 - (d) I cannot say.
- 23.** Under hedging approach to financing of working capital requirements of a firm, each asset in the balance sheet assets side would be offset with a

financing instrument of the same approximate maturity. This statement is:

- (a) Incorrect
- (b) Correct
- (c) Partially correct
- (d) I cannot say.

24. Trade credit is a:

- (a) Negotiated source of finance
- (b) Hybrid source of finance
- (c) Spontaneous source of finance (d) None of the above.

25. Factoring is a method of financing whereby a firm sells its trade debts at a discount to a financial institution. The statement is:

- (a) Correct
- (b) Incorrect
- (c) Partially correct
- (d) I cannot say.

26. A factoring arrangement can be both with recourse as well as without recourse:

- (a) True
- (b) False
- (c) Partially correct
- (d) Cannot say.

27. The Bank financing of working capital will generally be in the following form. Cash Credit, Overdraft, bills discounting, bills acceptance, line of credit; Letter of credit and bank guarantee.

- (a) I agree
 - (b) I do not agree
 - (c) I cannot say.
- 28.** When the items of inventory are classified according to value of usage, the technique is known as:
- (a) XYZ Analysis
 - (b) ABC Analysis
 - (c) DEF Analysis
 - (d) None of the above.
- 29.** When a firm advises its customers to mail their payments to special Post Office collection centers, the system is known as.
- (a) Concentration banking
 - (b) Lock Box system
 - (c) Playing the float
 - (d) None of the above.
- 30.** NV Industries Ltd. is a manufacturing industry which manages its accounts receivables internally by its sales and credit department. It supplies small articles to different industries. The total sales ledger of the company stands at ₹ 200 lakhs of which 80% is credit sales. The company has a credit policy of 2/40, net 120. Past experience of the company has been that on average out of the total, 50% of customers avail of discount and the balance of the receivables are collected on average in 120 days. The finance controller estimated, bad debt losses are around 1% of credit sales.

With escalating cost associated with the in-house management of the debtors coupled with the need to unburden the management with the task so as to focus on sales promotion, the CFO is examining the possibility of outsourcing its factoring service for managing its receivables. Currently, the firm spends about ₹ 2,40,000 per annum to

administer its credit sales. These are avoidable as a factoring firm is prepared to buy the firm's receivables. The main elements of the proposal are : (i) It will charge 2% commission (ii) It will pay advance against receivables to the firm at an interest rate of 18% after withholding 10% as reserve.

Also, company has option to take long term loan at 15% interest or may take bank finance for working capital at 14% interest.

You were also present at the meeting; being a financial consultant, the CFO has asked you to be ready with the following questions:

Consider year as 360 days.

I. What is average level of receivables of the company?

- a. ₹ 53,33,333
- b. ₹ 35,55,556**
- c. ₹ 44,44,444
- d. ₹ 71,11,111

II. How much advance factor will pay against receivables?

- a. ₹ 31,28,889
- b. ₹ 39,11,111
- c. ₹ 30,03,733**
- d. ₹ 46,93,333

III. What is the annual cost of factoring to the company?

- a. ₹ 8,83,200**
- b. ₹ 4,26,667
- c. ₹ 5,51,823
- d. ₹ 4,00,000

IV. What is the net cost to the company on taking factoring service?

Financial leverage must be -....."

- (a) 1.19
- (b) 1.13
- (c) 1.12
- (d) 1.15**

33. What is the maximum period for which company can accept Public Deposits?

- (a) 1 year
- (b) 6 months
- (c) 3 years**
- (d) 5 years

(MTP March - 2024)

Present Value and Future Value Tables, Table - 1
Future Value Interest Factors For Single Cash Flows.
Formula: $FV = (1 + K)^n$

Period (n) / per cent (k)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	20%
1	1.0100	1.0200	1.0300	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1.1300	1.1400	1.1500	1.1600	1.2000
2	1.0201	1.0404	1.0609	1.0816	1.1025	1.1236	1.1449	1.1664	1.1881	1.2100	1.2321	1.2544	1.2769	1.2996	1.3225	1.3456	1.4400
3	1.0303	1.0612	1.0927	1.1249	1.1576	1.1910	1.2250	1.2597	1.2950	1.3310	1.3676	1.4049	1.4429	1.4815	1.5209	1.5609	1.7280
4	1.0406	1.0824	1.1255	1.1699	1.2155	1.2625	1.3108	1.3605	1.4116	1.4641	1.5181	1.5735	1.6305	1.6890	1.7490	1.8106	2.0736
5	1.0510	1.1041	1.1593	1.2167	1.2763	1.3382	1.4026	1.4693	1.5386	1.6105	1.6851	1.7623	1.8424	1.9254	2.0114	2.1003	2.4883
6	1.0615	1.1262	1.1941	1.2653	1.3401	1.4185	1.5007	1.5869	1.6771	1.7716	1.8704	1.9738	2.0820	2.1950	2.3131	2.4364	2.9860
7	1.0721	1.1487	1.2299	1.3159	1.4071	1.5036	1.6058	1.7138	1.8280	1.9487	2.0762	2.2107	2.3526	2.5023	2.6600	2.8262	3.5832
8	1.0829	1.1717	1.2668	1.3686	1.4775	1.5938	1.7182	1.8509	1.9926	2.1436	2.3045	2.4760	2.6584	2.8526	3.0590	3.2784	4.2998
9	1.0937	1.1951	1.3048	1.4233	1.5513	1.6895	1.8385	1.9990	2.1719	2.3579	2.5580	2.7731	3.0040	3.2519	3.5179	3.8030	5.1598
10	1.1046	1.2190	1.3439	1.4802	1.6289	1.7908	1.9672	2.1589	2.3674	2.5937	2.8394	3.1058	3.3946	3.7072	4.0456	4.4114	6.1917
11	1.1157	1.2434	1.3842	1.5395	1.7103	1.8983	2.1049	2.3316	2.5804	2.8531	3.1518	3.4785	3.8359	4.2262	4.6524	5.1173	7.4301
12	1.1268	1.2682	1.4258	1.6010	1.7959	2.0122	2.2522	2.5182	2.8127	3.1384	3.4985	3.8960	4.3345	4.8179	5.3503	5.9360	8.9161
13	1.1381	1.2936	1.4685	1.6651	1.8856	2.1329	2.4098	2.7196	3.0658	3.4523	3.8833	4.3635	4.8980	5.4924	6.1528	6.8858	10.6993
14	1.1495	1.3195	1.5126	1.7317	1.9799	2.2609	2.5785	2.9372	3.3417	3.7975	4.3104	4.8871	5.5348	6.2613	7.0757	7.9875	12.8392
15	1.1610	1.3459	1.5580	1.8009	2.0789	2.3966	2.7590	3.1722	3.6425	4.1772	4.7846	5.4736	6.2543	7.1379	8.1371	9.2655	15.4070
16	1.1726	1.3728	1.6047	1.8730	2.1829	2.5404	2.9522	3.4259	3.9703	4.5950	5.3109	6.1304	7.0673	8.1372	9.3576	10.7480	18.4884
17	1.1843	1.4002	1.6528	1.9479	2.2920	2.6928	3.1588	3.7000	4.3276	5.0545	5.8951	6.8660	7.9861	9.2765	10.7613	12.4677	22.1861
18	1.1961	1.4282	1.7024	2.0258	2.4066	2.8543	3.3799	3.9960	4.7171	5.5599	6.5436	7.6900	9.0243	10.5752	12.3755	14.4625	26.6233
19	1.2081	1.4568	1.7535	2.1068	2.5270	3.0256	3.6165	4.3157	5.1417	6.1159	7.2633	8.6128	10.1974	12.0557	14.2318	16.7765	31.9480
20	1.2202	1.4859	1.8061	2.1911	2.6533	3.2071	3.8697	4.6610	5.6044	6.7275	8.0623	9.6463	11.5231	13.7435	16.3665	19.4608	38.3376
21	1.2324	1.5157	1.8603	2.2788	2.7860	3.3996	4.1406	5.0338	6.1088	7.4002	8.9492	10.8038	13.0211	15.6676	18.8215	22.5745	46.0051
22	1.2447	1.5460	1.9161	2.3699	2.9253	3.6035	4.4304	5.4365	6.6586	8.1403	9.9336	12.1003	14.7138	17.8610	21.6447	26.1864	55.2061
23	1.2572	1.5769	1.9736	2.4647	3.0715	3.8197	4.7405	5.8715	7.2579	8.9543	11.0263	13.5523	16.6266	20.3616	24.8915	30.3762	66.2474
24	1.2697	1.6084	2.0328	2.5633	3.2251	4.0489	5.0724	6.3412	7.9111	9.8497	12.2392	15.1786	18.7881	23.2122	28.6252	35.2364	79.4968
25	1.2824	1.6406	2.0938	2.6658	3.3864	4.2919	5.4274	6.8485	8.6231	10.8347	13.5855	17.0001	21.2305	26.4619	32.9190	40.8742	95.3962

Present Value and Future Value Tables, Table - 2

Future Value Interest Factors For an Annuity.

Formula: $Fv = [(1 + K)^n - 1]/k$

Period (n) / per cent (k)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	20%
1	1.0000	1.0200	1.0300	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1.1300	1.1400	1.1500	1.1600	1.2000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0700	2.0800	2.0900	2.1000	2.1100	2.1200	2.1300	2.1400	2.1500	2.1600	2.2000
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464	3.2781	3.3100	3.3421	3.3744	3.4069	3.4396	3.4725	3.5056	3.6400
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061	4.5731	4.6410	4.7097	4.7793	4.8498	4.9211	4.9934	5.0665	5.3680
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666	5.9847	6.1051	6.2278	6.3528	6.4803	6.6101	6.7424	6.8771	7.4416
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359	7.5233	7.7156	7.9129	8.1152	8.3227	8.5355	8.7537	8.9775	9.9299
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228	9.2004	9.4872	9.7833	10.0890	10.4047	10.7305	11.0668	11.4139	12.9159
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.2598	10.6366	11.0285	11.4359	11.8594	12.2997	12.7573	13.2328	13.7268	14.2401	16.4991
9	9.3685	9.7546	10.1591	10.5828	11.0266	11.4913	11.9780	12.4876	13.0210	13.5795	14.1640	14.7757	15.4157	16.0853	16.7858	17.5185	20.7989
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808	13.8164	14.4866	15.1929	15.9374	16.7220	17.5487	18.4197	19.3373	20.3037	21.3215	25.9587
11	11.5668	12.1687	12.8078	13.4864	14.2068	14.9716	15.7836	16.6455	17.5603	18.5312	19.5614	20.6546	21.8143	23.0445	24.3493	25.7329	32.1504
12	12.6825	13.4121	14.1920	15.0258	15.9171	16.8699	17.8885	18.9771	20.1407	21.3843	22.7132	24.1331	25.6502	27.2707	29.0017	30.8502	39.5805
13	13.8093	14.6803	15.6178	16.6268	17.7130	18.8821	20.1406	21.4953	22.9534	24.5227	26.2116	28.0291	29.9847	32.0887	34.3519	36.7862	48.4966
14	14.9474	15.9739	17.0863	18.2919	19.5986	21.0151	22.5505	24.2149	26.0192	27.9750	30.0949	32.3926	34.8827	37.5811	40.5047	43.6720	59.1959
15	16.0969	17.2934	18.5989	20.0236	21.5786	23.2760	25.1290	27.1521	29.3609	31.7725	34.4054	37.2797	40.4175	43.8424	47.5804	51.6595	72.0351
16	17.2579	18.6393	20.1569	21.8245	23.6575	25.6725	27.8881	30.3243	33.0034	35.9497	39.1899	42.7533	46.6717	50.9804	55.7175	60.9250	87.4421
17	18.4304	20.0121	21.7616	23.6975	25.8404	28.2129	30.8402	33.7502	36.9737	40.5447	44.5008	48.8837	53.7391	59.1176	65.0751	71.6730	105.931
18	19.6147	21.4123	23.4144	25.6454	28.1324	30.9057	33.9990	37.4502	41.3013	45.5992	50.3959	55.7497	61.7251	68.3941	75.8364	84.1407	128.117
19	20.8109	22.8406	25.1169	27.6712	30.5390	33.7600	37.3790	41.4463	46.0185	51.1591	56.9395	63.4397	70.7494	78.9692	88.2118	98.6032	154.740
20	22.0190	24.2974	26.8704	29.7781	33.0660	36.7856	40.9955	45.7620	51.1601	57.2750	64.2028	72.0524	80.9468	91.0249	102.444	115.380	186.688
21	23.2392	25.7833	28.6765	31.9692	35.7193	39.9927	44.8652	50.4229	56.7645	64.0025	72.2651	81.6987	92.4699	104.768	118.810	134.841	225.026
22	24.4716	27.2990	30.5368	34.2480	38.5052	43.3923	49.0057	55.4568	62.8733	71.4027	81.2143	92.5026	105.491	120.436	137.632	157.415	271.031
23	25.7163	28.8450	32.4529	36.6179	41.4305	46.9958	53.4361	60.8933	69.5319	79.5430	91.1479	104.603	120.205	138.297	159.276	183.601	326.237
24	26.9735	30.4219	34.4265	39.0826	44.5020	50.8156	58.1767	66.7648	76.7898	88.4973	102.174	118.155	136.831	158.659	184.168	213.978	392.484
25	28.2432	32.0303	36.4593	41.6459	47.7271	54.8645	63.2490	73.1059	84.7009	98.3471	114.413	133.334	155.620	181.871	212.793	249.214	471.981

Present Value and Future Value Tables, Table - 3
Future Value Interest Factors For Single Cash Flows.
Formula: $Fv = 1/(1 + K)^n$

Period (n) / per cent (k)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	20%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8333
2	0.9803	0.9612	0.9426	0.9246	0.9070	0.8900	0.8734	0.8573	0.8417	0.8264	0.8116	0.7972	0.7831	0.7695	0.7561	0.7432	0.6944
3	0.9706	0.9423	0.9151	0.8890	0.8638	0.8396	0.8163	0.7938	0.7722	0.7513	0.7312	0.7118	0.6931	0.6750	0.6575	0.6407	0.5787
4	0.9610	0.9238	0.8885	0.8548	0.8227	0.7921	0.7629	0.7350	0.7084	0.6830	0.6587	0.6355	0.6133	0.5921	0.5718	0.5523	0.4823
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	0.7130	0.6806	0.6499	0.6209	0.5935	0.5674	0.5428	0.5194	0.4972	0.4761	0.4019
6	0.9420	0.8880	0.8375	0.7903	0.7462	0.7050	0.6663	0.6302	0.5963	0.5645	0.5346	0.5066	0.4803	0.4556	0.4323	0.4104	0.3349
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835	0.5470	0.5132	0.4817	0.4523	0.4251	0.3996	0.3759	0.3538	0.2791
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	0.5820	0.5403	0.5019	0.4665	0.4339	0.4039	0.3762	0.3506	0.3269	0.3050	0.2326
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002	0.4604	0.4241	0.3909	0.3606	0.3329	0.3075	0.2843	0.2630	0.1938
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632	0.4224	0.3855	0.3522	0.3220	0.2946	0.2697	0.2472	0.2267	0.1615
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289	0.3875	0.3505	0.3173	0.2875	0.2607	0.2366	0.2149	0.1954	0.1346
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.4970	0.4440	0.3971	0.3555	0.3186	0.2858	0.2567	0.2307	0.2076	0.1869	0.1685	0.1122
13	0.8787	0.7730	0.6810	0.6006	0.5303	0.4688	0.4150	0.3677	0.3262	0.2897	0.2575	0.2292	0.2042	0.1821	0.1625	0.1452	0.0935
14	0.8700	0.7579	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405	0.2992	0.2633	0.2320	0.2046	0.1807	0.1597	0.1413	0.1252	0.0779
15	0.8613	0.7430	0.6419	0.5553	0.4810	0.4173	0.3624	0.3152	0.2745	0.2394	0.2090	0.1827	0.1599	0.1401	0.1229	0.1079	0.0649
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919	0.2519	0.2176	0.1883	0.1631	0.1415	0.1229	0.1069	0.0930	0.0541
17	0.8444	0.7142	0.6050	0.5134	0.4363	0.3714	0.3166	0.2703	0.2311	0.1978	0.1696	0.1456	0.1252	0.1078	0.0929	0.0802	0.0451
18	0.8360	0.7002	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502	0.2120	0.1799	0.1528	0.1300	0.1108	0.0946	0.0808	0.0691	0.0376
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317	0.1945	0.1635	0.1377	0.1161	0.0981	0.0829	0.0703	0.0596	0.0313
20	0.8195	0.6730	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145	0.1784	0.1486	0.1240	0.1037	0.0868	0.0728	0.0611	0.0514	0.0261
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987	0.1637	0.1351	0.1117	0.0926	0.0768	0.0638	0.0531	0.0443	0.0217
22	0.8034	0.6468	0.5219	0.4220	0.3418	0.2775	0.2257	0.1839	0.1502	0.1228	0.1007	0.0826	0.0680	0.0560	0.0462	0.0382	0.0181
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703	0.1378	0.1117	0.0907	0.0738	0.0601	0.0491	0.0402	0.0329	0.0151
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.2470	0.1971	0.1577	0.1264	0.1015	0.0817	0.0659	0.0532	0.0431	0.0349	0.0284	0.0126
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.2330	0.1842	0.1460	0.1160	0.0923	0.0736	0.0588	0.0471	0.0378	0.0304	0.0245	0.0105

Present Value and Future Value Tables, Table - 4

Future Value Interest Factors For Annuity.

Formula: $Fv = [1 - 1/(1 + K)^n]/k$

Period (n) / per cent (k)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	20%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8333
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.7125	1.6901	1.6681	1.6467	1.6257	1.6052	1.5278
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4437	2.4018	2.3612	2.3216	2.2832	2.2459	2.1065
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.1024	3.0373	2.9745	2.9137	2.8550	2.7982	2.5887
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6959	3.6048	3.5172	3.4331	3.3522	3.2743	2.9906
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.2305	4.1114	3.9975	3.8887	3.7845	3.6847	3.3255
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.7122	4.5638	4.4226	4.2883	4.1604	4.0386	3.6046
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	5.1461	4.9676	4.7988	4.6389	4.4873	4.3436	3.8372
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.5370	5.3282	5.1317	4.9464	4.7716	4.6065	4.0310
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.8892	5.6502	5.4262	5.2161	5.0188	4.8332	4.1925
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	6.2065	5.9377	5.6869	5.4527	5.2337	5.0286	4.3271
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.4924	6.1944	5.9176	5.6603	5.4206	5.1971	4.4392
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.7499	6.4235	6.1218	5.8424	5.5831	5.3423	4.5327
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.9819	6.6282	6.3025	6.0021	5.7245	5.4675	4.6106
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	7.1909	6.8109	6.4624	6.1422	5.8474	5.5755	4.6755
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	7.3792	6.9740	6.6039	6.2651	5.9542	5.6685	4.7296
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.5488	7.1196	6.7291	6.3729	6.0472	5.7487	4.7746
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.7016	7.2497	6.8399	6.4674	6.1280	5.8178	4.8122
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.8393	7.3658	6.9380	6.5504	6.1982	5.8775	4.8435
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.9633	7.4694	7.0248	6.6231	6.2593	5.9288	4.8696
21	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922	8.6487	8.0751	7.5620	7.1016	6.6870	6.3125	5.9731	4.8913
22	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424	8.7715	8.1757	7.6446	7.1695	6.7429	6.3587	6.0113	4.9094
23	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	9.5802	8.8832	8.2664	7.7184	7.2297	6.7921	6.3988	6.0442	4.9245
24	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066	8.9847	8.3481	7.7843	7.2829	6.8351	6.4338	6.0726	4.9371
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	8.4217	7.8431	7.3300	6.8729	6.4641	6.0971	4.9476

Standard Normal Distribution Table

Entries represent $\Pr(Z \leq z)$. The value of z to the first decimal is given in the left column. The second decimal is given in the top row.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986

Values of z for selected values of $\Pr(Z \leq z)$

z	0.842	1.036	1.282	1.645	1.960	2.326	2.576
$\Pr(Z \leq z)$	0.800	0.850	0.900	0.950	0.975	0.990	0.995

Normal Probability Distribution Table

Number of Standard Deviations From Mean (Z)	Area to the Left or Right (One Tail)	Number of Standard Deviations From Mean (Z)	Area to the Left or Right (One Tail)
0.00	0.5000	1.55	0.0606
0.05	0.4801	1.60	0.0548
0.10	0.4602	1.65	0.0495
0.15	0.4404	1.70	0.0446
0.20	0.4207	1.75	0.0401
0.25	0.4013	1.80	0.0359
0.30	0.3821	1.85	0.0322
0.35	0.3632	1.90	0.0287
0.40	0.3446	1.95	0.0256
0.45	0.3264	2.00	0.0228
0.50	0.3085	2.05	0.0202
0.55	0.2912	2.10	0.0179
0.60	0.2743	2.15	0.0158
0.65	0.2578	2.20	0.0139
0.70	0.2420	2.25	0.0122
0.75	0.2264	2.30	0.0107
0.80	0.2119	2.35	0.0094
0.85	0.1977	2.40	0.0082
0.90	0.1841	2.45	0.0071
0.95	0.1711	2.50	0.0062
1.00	0.1557	2.55	0.0054
1.05	0.1469	2.60	0.0047
1.10	0.3570	2.65	0.0040
1.15	0.1251	2.70	0.0035
1.20	0.1151	2.75	0.0030
1.25	0.1056	2.80	0.0026
1.30	0.0986	2.85	0.0022
1.35	0.0885	2.90	0.0019
1.40	0.0808	2.95	0.0016
1.45	0.0735	3.00	0.0013
1.50	0.0668		

Student's T Distribution

Level of Significance for One Tailed Test						
df	0.100	0.050	0.025	0.01	0.005	0.0005
Level of Significance for Two Tailed Test						
df	0.20	0.10	0.05	0.02	0.01	0.001
1	3.078	6.314	12.706	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.599
3	1.638	2.353	3.182	4.541	5.841	12.294
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.869
6	1.440	1.943	2.447	3.140	3.707	5.959
7	1.415	1.895	2.365	2.998	3.499	5.408
8	1.397	1.860	2.306	2.896	3.355	5.041
9	1.383	1.833	2.262	2.821	3.250	4.781
10	1.372	1.812	2.228	2.764	3.169	4.587
11	1.363	1.796	2.201	2.718	3.106	4.437
12	1.356	1.782	2.179	2.681	3.055	4.318
13	1.350	1.771	2.160	2.650	3.012	4.221
14	1.345	1.761	2.145	2.624	2.977	4.140
15	1.341	1.753	2.131	2.602	2.947	4.073
16	1.337	1.746	2.120	2.583	2.921	4.015
17	1.333	1.740	2.110	2.567	2.898	3.965
18	1.330	1.734	2.101	2.552	2.878	3.922
19	1.328	1.729	2.093	2.539	2.861	3.883
20	1.325	1.725	2.086	2.528	2.845	3.850
21	1.323	1.721	2.080	2.518	2.831	3.819
22	1.321	1.717	2.074	2.508	2.819	3.792
23	1.319	1.714	2.069	2.500	2.807	3.768
24	1.318	1.711	2.064	2.492	2.797	3.745
25	1.316	1.708	2.060	2.485	2.787	3.725
26	1.315	1.706	2.056	2.479	2.779	3.707
27	1.314	1.703	2.052	2.473	2.771	3.690
28	1.313	1.701	2.048	2.467	2.763	3.674
29	1.311	1.699	2.045	2.462	2.756	3.666
30	1.310	1.697	2.042	2.457	2.750	3.646
40	1.303	1.684	2.021	2.423	2.704	3.551
60	1.296	1.671	2.000	2.390	2.660	3.460
120	1.289	1.658	1.980	2.358	2.617	3.373
0	1.282	1.645	1.9600	2.326	2.576	3.291

Continuous Compounding, Discrete Cash Flows

r = 1%

	SINGLE PAYMENT		UNIFORM SERIES				Arithmetic Gradient Series Factor
	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Uniform Series Factor	Capital Recovery Factor	Series Present Worth Factor	
N	(F/P,r,N)	(P/F,r,N)	(A/F,r,N)	(F/A,r,N)	(A/P,r,N)	(P/A,r,N)	(A/G,r,N)
1	1.0101	0.99005	1.00000	1.0000	1.01010	0.99005	0.00000
2	1.0202	0.98020	0.49750	2.0101	0.50755	1.97025	0.49750
3	1.0305	0.97045	0.33001	3.0303	0.34006	2.94069	0.99333
4	1.0408	0.96079	0.24626	3.0303	0.25631	3.90148	1.48750
5	1.0513	0.95123	0.19602	5.1015	0.20607	4.85271	1.98000
6	1.0618	0.94176	0.16253	6.1528	0.17258	5.79448	2.47084
7	1.0725	0.93239	0.13861	7.2146	0.14866	6.72687	2.96000
8	1.0833	0.92312	0.12067	8.2871	0.13072	7.64999	3.44751
9	1.0942	0.91393	0.10672	9.3704	0.11677	8.56392	3.93334
10	1.1052	0.90484	0.09556	10.4646	0.10561	9.46876	4.41751
11	1.1163	0.89583	0.08643	11.5698	0.09648	10.36459	4.90002
12	1.1275	0.88692	0.07883	12.6860	0.08888	11.25151	5.38086
13	1.1388	0.87810	0.07239	13.8135	0.08244	12.12961	5.86004
14	1.1503	0.86936	0.06688	14.9524	0.07693	12.99896	6.33755
15	1.1618	0.86071	0.06210	16.1026	0.07215	13.85967	6.81340
16	1.1735	0.85214	0.05792	17.2645	0.06797	14.71182	7.28759
17	1.1853	0.84366	0.05424	18.438	0.06429	15.55548	7.76012
18	1.1972	0.83527	0.05096	19.6233	0.06101	16.39075	8.23098
19	1.2092	0.82696	0.04803	20.8205	0.05808	17.21771	8.70018
20	1.2214	0.81873	0.04539	22.0298	0.05544	18.03644	9.16772
21	1.2337	0.81058	0.04301	23.2512	0.05306	18.84703	9.63360
22	1.2461	0.80252	0.04084	24.4848	0.05089	19.64954	10.09782
23	1.2586	0.79453	0.03886	25.7309	0.04891	20.44408	10.56039
24	1.2712	0.78663	0.03705	26.9895	0.04710	21.23071	11.02129
25	1.2840	0.7788	0.03538	28.2608	0.04543	22.00951	11.48054
26	1.2969	0.77105	0.03385	29.5448	0.04390	22.78056	11.93813
27	1.3000	0.76338	0.03242	30.8417	0.04247	23.54394	12.39407
28	1.3231	0.75578	0.03110	32.1517	0.04115	24.29972	12.84835
29	1.3364	0.74826	0.02987	33.4748	0.03992	25.04798	13.30098
30	1.3499	0.74082	0.02873	34.8112	0.03878	25.78880	13.75196
31	1.3634	0.73345	0.02765	36.1611	0.03770	26.52225	14.20128
32	1.3771	0.72615	0.02665	37.5245	0.03670	27.24840	14.64895
33	1.3391	0.71892	0.02571	38.9017	0.03576	27.96732	15.09498
34	1.4049	0.71177	0.02482	40.2926	0.03487	28.67909	15.53935
35	1.4191	0.70469	0.02398	41.6976	0.03403	29.38378	15.98208
40	1.4918	0.67032	0.02043	48.9370	0.03048	32.80343	18.17104
45	1.5683	0.63763	0.01768	56.5475	0.02773	36.05630	20.31900
50	1.6487	0.60653	0.01549	64.5483	0.02554	39.15053	22.42613
55	1.7333	0.57695	0.01371	72.9593	0.02376	42.09385	24.49262
60	1.8221	0.54881	0.01222	81.8015	0.02227	44.89362	26.51868
65	1.9155	0.52205	0.01098	91.0971	0.02103	47.55684	28.30455
70	2.0138	0.49659	0.00991	100.869	0.01996	50.09018	30.45046
75	2.117	0.47237	0.00900	111.142	0.01905	52.49997	32.35670
80	2.2255	0.44933	0.00820	121.942	0.01825	54.79223	34.22354
85	2.3396	0.42741	0.00750	133.296	0.01755	56.97269	36.05128
90	2.4596	0.40657	0.00689	145.232	0.01694	59.04681	37.84024
95	2.5857	0.38674	0.00634	157.779	0.01639	61.01978	39.59075
100	2.7183	0.36788	0.00585	170.970	0.01582	63.21206	41.30316