Chapter 4

Mathematics for Finance

Past Trends

Attempt	SI & CI	Annuity and Other	Total
May 2018	3	3	6
Nov 2018	11	3	14
Jun 2019	7	3	10
Nov 2019	10	3	10
Nov 2020	7	7	14
Jan 2021	10	4	14
Jul 2021	6	7	13
Dec 2021	4	3	7
Jun 2022	2	8	10
Dec 2022	8	6	14
June 2023	7	7	14
Dec 2023	7	7	14
June 2024	5	9	14
Sep 2024			
Jan 2025			

Calculator Tricks & Basics

Power (Integer)	Base [×][=][=][=]... ↑ square ↑ cube
n^{th} power (Non-Integer)	Base [√][√][√]...12times..[−1][×][n][+1][×=][×=][×=]...12times
n^{th} root	Base [√][√][√]...12times..[−1][÷][n][+1][×=][×=][×=]...12times
Reciprocal of any number	[÷][=]
Trick of sum product by Memory Button	$a_1 \times b_1$ [M+] $a_2 \times b_2$ [M+] $a_3 \times b_3$ [M+] [MRC]

Trick of sum product by GT Button	$a_1 \times b_1 =$ $a_2 \times b_2 =$ $a_3 \times b_3 =$ GT

					PP
(1)	*Evaluate* 7^6				
	a.	*823543*	*b.*	*117649*	
	c.	*16807*	*d.*	*None*	
					PP
(2)	*Evaluate* $(1.63)^{12}$				
	a.	*573.38*	*b.*	*122790.4*	
	c.	*351.76*	*d.*	*None*	
					PP
(3)	*Evaluate* $(7/5)^6$				
	a.	*7.529*	*b.*	*0.133*	
	c.	*10.54*	*d.*	*None*	
					PP
(4)	*Find the reciprocal of 0.025*				
	a.	*25*	*b.*	*40*	
	c.	*4*	*d.*	*None*	
					PP
(5)	*Find the value of x if* $x = \frac{500}{(1.02)^5}$				
	a.	*362*	*b.*	*552.04*	
	c.	*452.8*	*d.*	*None*	
					PP
(6)	*Evaluate* $(1.02)^{4.8}$				
	a.	*1.048*	*b.*	*1.099*	
	c.	*1.153*	*d.*	*None*	
					PP
(7)	*Calculate* $\sqrt[5]{7}$				
	a.	*1.475*	*b.*	*2.64*	
	c.	*16807*	*d.*	*None*	

Basics

Reasons to pay/ receive Interest	*Opportunity Cost*	▪ *To lend money to others, we sacrifice the return on investing that money somewhere else*
	Inflation	▪ *Time Factor: Due to inflation a given amount of money buys fewer goods in the future than it will now*
	Liquidity Preference	▪ *After lending, money is not available for immediate use*
	Risk Factor	▪ *There is always a risk that borrower will not repay at all.*

Basic Terms	*Interest*	*Interest is the **price paid** by a borrower for the **use of a lender's** money.*
	Principal	*Principal is initial value of **lending** (or **borrowing**).*
	Rate of Interest	*The rate at which the interest is charged for a defined length of time for use of principal generally on a **yearly basis** is known to be the rate of interest.*
	Accumulated Balance	*Accumulated amount is the **final value** of an investment. It is the **sum total** of principal and interest earned.*

Simple Interest

Concept	▪ *Simple interest is the interest computed on the principal **for the entire period** of borrowing.* ▪ *It is calculated on the **principal amount only** and not on interest previously earned.* ▪ *Value of Interest **remains constant** for each year*
Formula of Simple Interest	$SI = \frac{P.r.t}{100}$ *P = principal value, r = rate of interest per annum, t = time in years*
Formula of Amount as per Simple Interest	$A = P + SI$ $A = P + \frac{P.r.t}{100} = P(1 + \frac{rt}{100})$

ICAI SM

(8) *Simple interest on ₹ 3500 for 3 years at 12% per annum is*

a. *₹ 1200* *b.* *₹ 1260*

c. *₹ 2260* *d.* *₹ 2000*

ICAI SM

(9) *The sum required to earn a monthly interest of Rs 1200 at 18% per annum Simple Interest is*

a. *₹ 50,000* *b.* *₹ 60,000*

c. *₹ 80,000* *d.* *none of these*

MTP Nov 18

(10) What principal will amount to ₹ 370 in 6 years at 8% p.a. at simple interest

a. ₹ 210 b. ₹ 250

c. ₹ 310 d. ₹ 310

MTP May 19

(11) A certain money doubles itself in 10 years when deposited on simple interest. It would triple itself in

a. 30 years b. 20 years

c. 25 years d. 15 years

ICAI SM

(12) A sum of money amounts to ₹6,200 in 2 years and ₹7,400 in 3 years. The principal and rate of interest are

a. 3800, 3.57% b. 3000, 20%

c. 3500, 15% d. None

MTP May 20

(13) A sum of ₹ 46,875 was lent out at simple interest and at the end of 1 year 8months the total amount was ₹ 50,000. Find the rate of interest percent per annum.

a. 5% b. 6%

c. 4% d. 8%

PYQ June 22

(14) In how much time a sum of amount doubles at simple interest at 12.5% rate?

a. 7 years b. 8 years

c. 9 years d. 10 years

MTP Apr 21

(15) Two equal sums were lent out at 7% and 5% simple interest respectively. The interest earned on the two loans adds up to ₹ 960 for four years. Find the total sum lent out.

a. ₹ 4000 b. ₹ 3000

c. ₹ 5000 d. ₹ 6000

MTP Oct 21

(16) A sum of money gets doubled in 5 years at X% simple interest. If the interest was Y%, the sum of money would have become ten-fold in thirty years. What is $Y - X$ in %?

a. 10 b. 5

c. 8 d. none of these

PYQ June 19

(17) In simple interest if the principal is ₹ 2,000 and the rate and time are the roots of the equation $x^2 - 11x + 30 = 0$ then simple interest is

a. ₹ 500 b. ₹ 600

c. ₹ 700 d. ₹ 800

PYQ Nov. 20

(18) What sum of money will produce ₹ 42,800 as an interest in 3 years and 3 months at 2.5% p.a. simple interest?

a. ₹ 3,78,000 b. ₹ 5,26,769

c. ₹ 4,22,000 d. ₹ 2,24,000

PYQ Dec. 21

(19) *Rahul invested ₹ 70,000 in a bank at the rate of 6.5% p.a. simple interest rate. He received ₹ 85,925 after the end of term. Find out the period for which sum was invested by Rahul.*

a. 2 years b. 3 years
c. 3.5 years d. 2.5 years

MTP Nov 18

(20) *The simple interest of P% for P years will be ₹ P on a sum of :*

a. ₹ $p/100$
b. ₹ $\frac{100}{p}$
c. ₹ $\left(\frac{p}{100}+1\right)$
d. ₹ $\left(\frac{100}{p}-1\right)$

MTP March 22

(21) *How much time would the simple interest on a certain sum be 0.125 times the principal at 10% per annum*

a. $1\frac{1}{4}$ years b. $1\frac{3}{4}$ years
c. $2\frac{1}{4}$ years d. $2\frac{3}{4}$ years

MTP Dec 22 – Series I

(22) *An investor is saving to pay off an obligation of ₹ 15,250 which will due in seven years, if the investor is earning 7.5% simple interest rate per annum, he must deposit ₹ _____ to meet the obligation.*

a. ₹ 8000 b. ₹ 9000
c. ₹ 10000 d. ₹ 11000

MTP Jun 23 Series I

(23) *₹ 80,000 is invested to earn a monthly interest of ₹ 1200 at the rate of _____p.a. Simple interest.*

a. 12% b. 14%
c. 16% d. 18%

Compound Interest

Basics	▪ *We can define the compound interest as the interest* ***that accrues*** *when earnings for each specified period* ***are added to the principal.*** ▪ *In CI, after every conversion period we increase the* ***principal base*** *on which* ***subsequent interest*** *is computed.*

<table>
<tr><td>Conversion Period</td><td>Conversion Period: Period for which interest is computed
<table>
<tr><th>Conversion Period</th><th>Description</th><th>Number of Conversion Period in a year</th></tr>
<tr><td>1 day</td><td>Compounded Daily</td><td>365</td></tr>
<tr><td>1 month</td><td>Compounded Monthly</td><td>12</td></tr>
<tr><td>3 months</td><td>Compounded Quarterly</td><td>4</td></tr>
<tr><td>6 months</td><td>Compounded Semi Annually</td><td>2</td></tr>
<tr><td>12 months</td><td>Compounded Annually</td><td>1</td></tr>
</table></td></tr>
<tr><td>Formula for Amount as per Compound Interest</td><td>$$A = P(1+i)^n$$where,
P = Initial Principal, i = adjusted interest rate, n = no. of periods$$i = \frac{r\%}{nocppy},\quad n = t \times noccpy$$</td></tr>
<tr><td>Formula for Compound Interest</td><td>$$CI = A - P$$$$CI = P(1+i)^n - P$$$$CI = P[(1+i)^n - 1]$$where,
P = initial principal, i = adjusted interest rate, n = no. of periods</td></tr>
<tr><td>Trick for Amount as per Compound Interest</td><td>$$\boxed{P}\boxed{+}\boxed{i}\boxed{\%}\boxed{+}\boxed{i}\boxed{\%}\boxed{+}\ldots n \text{ times}$$Suitable when value of n is small</td></tr>
<tr><td>Effective Rate of Interest</td><td>Equivalent annual rate of interest compounded annually if interest is compounded more than once a year. Effective rate is not dependent on Principal.$$E = [(1+i)^n - 1]$$</td></tr>
<tr><td>CI Concept in WDV Depreciation</td><td>$$A = P(1-i)^n$$where, P = Historical Cost of Asset, A = Scrap Value/ Residual value of asset, n = no. of periods, i = Depreciation %</td></tr>
</table>

ICAI SM

(24) *₹2000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done (a) Annually (b) Semi-annually (c) Quarterly (d) Monthly*

a. *2420, 2605, 2436.8, 2440.58*
b. *2200, 2605, 2183.7, 2366.48*
c. *2420, 2431, 2436.8, 2440.58*
d. *2420, 2431, 2436.8, 2496.68*

PYQ Nov. 18

(25) *A man deposited ₹ 8,000 in a bank for 3 years at 5% per annum compound interest, after 3 years he will get*

a. *₹ 8,800* *b.* *₹ 9,261*
c. *₹ 9,200* *d.* *₹ 9,000*

PYQ Nov. 18

(26) *How much will ₹ 25,000 amount to in 2 years at compound interest if the rates for the successive years are 4% and 5% per year*

a. ₹ 27,300 b. ₹ 27,000
c. ₹ 27,500 d. ₹ 27,900

PYQ Nov. 18

(27) *If ₹ 10,000 is invested at 8% per year compounded quarterly, then the value of the investment after 2 years is: [Given $(1+0.02)^8 = 1.171659$]*

a. ₹ 11,716.59 b. ₹ 10,716.59
c. ₹ 117.1659 d. None of these

PYQ Nov. 20

(28) *Find the compound interest if an amount of ₹ 50,000 is deposited in bank for one year at the rate of 8% per annum compounded semi-annually.*

a. ₹ 3,080 b. ₹ 4,080
c. ₹ 5,456 d. ₹ 7,856

PYQ Nov. 20

(29) *On what sum will the compound interest at 5% per annum for 2 years compounded annually be ₹ 3,280.*

a. ₹ 32,000 b. ₹ 16,000
c. ₹ 48,000 d. ₹ 64,000

PYQ Nov. 18

(30) *The effective rate of interest for one year deposit corresponding to a nominal 7% rate of interest per annum convertible quarterly is*

a. 7% b. 7.5%
c. 7.4% d. 7.18%

PYQ Nov. 20

(31) *An amount is lent at a nominal rate of 4.5% per annum compounded quarterly. What would be the gain in rupees over when compounded annually?*

a. 0.56 b. 0.45
c. 0.076 d. 0.85

PYQ Nov. 19

(32) *Scrap value of a machine valued at ₹ 10,00,000, after 10 years within depreciation at 10% p.a.:*

a. ₹ 3,48,678.44 b. ₹ 3,84,679.45
c. ₹ 4,00,000 d. ₹ 3,00,000

PYQ Jan. 21

(33) *The population of a town increase by 2% of the population at the beginning of the year. The number of year by which the total increases in population would be 40% is:*

a. 7 years
b. 10 years
c. 17 years
d. 19 years (approx.)

PYQ Dec 22

(34) *A sum of money invested of compound interest double itself in four years. In how many years it become 32 times of itself at the same rate of compound interest?*

a. 12 years b. 16 years
c. 20 years d. 24 years

PYQ Jun 23

(35) *The difference between compound interest and simple interest on a certain sum of money invested for 3 years at 6% per annum is ₹ 110.16. The principal is*

a. ₹ 3,000 b. ₹ 3,700
c. ₹ 12,000 d. ₹ 10,000

PYQ May 18

(36) *If an amount is kept at S I. it earns an interest of ₹ 600 in first two years but when kept at compound interest it earns an interest of ₹ 660 for the same period, then the rate of interest and principal amount respectively are:*

a. 20%, ₹ 1,200 b. 20%, ₹ 1,500
c. 10%, ₹ 1,200 d. 10%, ₹ 1,500

PYQ Nov. 18

(37) *If compound interest on a sum for 2 years at 4% per annum is ₹ 102, then the simple interest on the same sum for the same period at the same rate will be*

a. ₹ 99 b. ₹ 101
c. ₹ 100 d. ₹ 95

PYQ June 19

(38) *A sum was invested for 3 years as per C.I. and the rate of interest for first year is 9%, 2nd year is 6% and 3rd year is 3% p.a. respectively. Find the sum if the amount in three years is ₹ 550?*

a. ₹ 250 b. ₹ 300
c. ₹ 462.16 d. ₹ 350

PYQ Nov. 19

(39) *The difference between CI and SI for 2 years is 21. If rate of interest is 5% find principal*

a. ₹ 8,400 b. ₹ 4,800
c. ₹ 8,000 d. ₹ 8,200

PYQ Jan. 21

(40) *Which is a better investment 9% p.a. compounded quarterly or 9.1% p.a. simple interest?*

a. 9% compounded
b. 9.1% S.T.
c. Both are same
d. Cannot be said

ICAI SM

(41) *The annual birth rates and death rates per 1,000 are 39.4 and 19.4 respectively. The number of years which the population will be doubled assuming there is no immigration or emigration is*

a. 35 years b. 30 years
c. 25 years d. none of these

MTP May 20

(42) *The compound interest on half-yearly rests on ₹ 10,000 the rate for the first and second years being 6% and for the third year 9% p.a. is*

a.	*₹ 2,200*	*b.*	*₹ 2,287*
c.	*₹ 2,285*	*d.*	*₹ 2290.84*

MTP Oct 21

(43) *The ratio of principal and the compound interest value for three years (compounded annually) is 216 : 127. The rate of interest is:*

a.	*0.1777*	*b.*	*0.1567*
c.	*0.1666*	*d.*	*0.1587*

MTP Dec 22 – Series I

(44) *Effective rate of interest does not depend upon*

a. *Amount of Principal*
b. *Amount of Interest*
c. *Number of conversion periods*
d. *none of these*

MTP Dec 22 Series II

(45) *The difference in simple interest of a sum invested of ₹ 1,500 for 3 years is ₹ 18. The difference in their rates in % is:*

a.	*0.4*	*b.*	*0.6*
c.	*0.8*	*d.*	*0.10*

Types of Cashflows

Single Cashflow	*If single amount is paid or received initially and then direct finally at the end*
Annuity	*Annuity can be defined as a sequence of **constant periodic** payments (or receipts) regularly over a specified period.*
Types of Annuities	*Annuity Regular* – *First payment/receipt at the end of the period* *Annuity Due* – *First payment/receipt at the beginning of the period*

Future Value

Future Value – Single Cashflow	▪ *Future value is the **cash value** of an **investment** at some time in the future.* ▪ *It is **tomorrow's value** of today's money **compounded** at the rate of interest.*
Formula for FV of Single Cashflow	$FV = CF(1+i)^n$ *where, CF = single cashflow for which FV is to be calculated, i = adjusted interest rate, n = no. of periods*

FV of Annuity Regular	▪ *To calculate **final maturity value** of an investment like RD where sum is invested in the annuity pattern starting at the end of each period.* ▪ *To calculate the final value of Sinking Fund or Savings amount to achieve the **target maturity value.***
Formula for Future Value - Annuity Regular	$$FVAR = A_i \times FVAF(n,i)$$ $$FVAR = A_i \times \left\{\frac{[(1+i)^n - 1]}{i}\right\}$$ *where, **FVAR** = Future Value of Annuity Regular, **A**$_i$ = Annuity Value (Installment), **FVAF** = Future Value Annuity Factor, **i** = adjusted interest rate, **n** = no. of periods*
FV of Annuity Due	▪ *To calculate final maturity value of an investment like RD where sum is invested in the annuity pattern **at the beginning of each period*** ▪ *To calculate final maturity value of an investment like RD where sum is invested in the annuity pattern at the beginning of each period*
Formula for Future Value - Annuity Due	$$FVAD = A_i \times FVAF(n,i) \times (1+i)$$ $$FVAD = A_i \times \left\{\frac{[(1+i)^n - 1]}{i}\right\} \times (1+i)$$ ***where, FVAD**= Future Value of Annuity Due, **A**$_i$ = Annuity Value (Installment), **FVAF** = Future Value Annuity Factor, **i** = adjusted interest rate, **n** = no. of periods*
Sinking Fund	▪ *It is the **fund credited** for a specified purpose by way of **sequence of periodic payments** over a **time-period** at a specified interest rate.* ▪ *Interest is compounded at the **end of every period**.* ▪ *Size of the sinking fund deposit is same as Future Value of Annuity*

Present Value

Present Value of Single Cashflow	▪ *Present value is **today's value** of tomorrow's money **discounted** at the interest rate*
Formula for PV of Single Cashflow	$$PV = CF \times \frac{1}{(1+i)^n}$$ *where, CF = Single Cashflow for which PV is to be calculated, i = adjusted interest rate, n = no. of periods*
Single Cashflow Compounding and Discounting Factors	*Compounding (Adding the interest)* : $(1+i)^n$ *Discounting (Removing the interest)* : $\frac{1}{(1+i)^n}$

Present Value – Annuity Regular	***Use:*** *To calculate* ***loan amount*** *when periodic installments value are given and vice versa.* ***Application:*** *Leasing, Capital Expenditure etc.*
Formula for PV of Annuity Regular	$PVAR = A_i \times PVAF(n,i)$ $PVAR = A_i \times \left[\frac{1}{i} \times \left\{1 - \frac{1}{(1+i)^n}\right\}\right]$ ***where, PVAR*** *= Present Value of Annuity Regular,* A_i *= Annuity Value (Installment),* ***PVAF*** *= Present Value Annuity Factor,* ***i*** *= adjusted interest rate,* ***n*** *= no. of periods*
Calculator Trick for PVAF	$\boxed{1+i}\boxed{\div}\boxed{=}\boxed{=}$ *...n times* $\boxed{GT}$ $\boxed{1+i}\boxed{\div}\boxed{=}\boxed{M+}\boxed{=}\boxed{M+}\boxed{=}\boxed{M+}$ *...n times* $\boxed{MRC}$
Formula for Present Value of Annuity Due	$PVAD = \left[A_i \times PVAF\left\{(n-1),i\right\}\right] + A_i$

ICAI SM

(46) *You invest ₹ 3000 in a two year investment that pays you 12% per annum. Calculate the future value of the investment.*

a. 3360 *b.* 3900
c. 3720 *d.* 3763.2

PYQ Nov. 20

(47) *Find the future value of annuity of ₹ 1,000 made annually for 7 years at interest rate of 14% compounded annually. Given that* $1.14^7 = 2.5023$

a. 10,730.7 *b.* 5,365.35
c. 8,756 *d.* 9,892.34

PYQ Dec 22

(48) *Raju invests ₹ 20,000 every year in a deposit scheme starting from today for next 12 years. Assuming that interest rate on this deposit is 7% per annum compounded annually. What will be the future value of this annuity? Given that* $(1+0.07)^{12} = 2.25219159$.

a. ₹ 540,526 *b.* ₹ 382,813
c. ₹ 643,483 *d.* ₹ 357,769

PYQ Jun 23

(49) *A company want to replace its existing tool room machine at the end of 10 years, the expected cost of machine would be ₹ 10,00,000. If management of the company creates a sinking fund, how much provision needs to be made out of revenue each year which can earn at the rate of 10% compounded annually?*

a. ₹ 74,625 *b.* ₹ 72,514
c. ₹ 62,745 *d.* ₹ 67,245

PYQ Nov. 20

(50) *Find the present value of ₹ 1,00,000 to be required after 5 years if the interest rate be 9% . Given that $1.09^5 = 1.5386$*

a. 78,995.98 *b.* 64,994.15
c. 88,992.43 *d.* 93,902.12

PYQ Nov. 20

(51) *₹ 2,500 is paid every year for 10 years to pay off a loan. What is the loan amount if interest rate be 14% per annum compounded annually?*

a. ₹ 15,847.90 *b.* ₹ 13,040.27
c. ₹ 14,674.21 *d.* ₹ 16,345.11

PYQ June 22

(52) *Anshika took a loan of ₹ 1,00,000 @ 8% for 5 years. What amount will she pay if she wants to pay the whole amount in five equal installments?*

a. ₹ 25,045.63 *b.* ₹ 26,045.68
c. ₹ 28,045.50 *d.* None of these

PYQ Jun 23

(53) *Govinda's mother decides to gift him ₹ 50,000 every year starting from today for the next five years. Govinda deposits this amount in a bank as and when he receives and gets 10% per annum interest rate, compounded annually. What is the present value of this annuity? Given P(4,0.10) = 3.16987.*

a. ₹ 2,80,493.5 *b.* ₹ 2,08,493.5
c. ₹ 2,08,943.5 *d.* ₹ 2,58,493.5

MTP May 19

(54) *Y bought Motor Bike Costing 80,000 by making down payment of ₹ 30000 and agreeing to make annual payment for four years. How much would be each payment if the interest on unpaid amount be 14% compounded annually. [Given P (4, 0.14) = 2.91371]*

a. ₹ 17160.25 *b.* ₹ 17600.25
c. ₹ 15600.25 *d.* ₹ 16600.25

MTP Jun 23 Series II

(55) *The amount of an annuity due consisting of 15 annual payments invested at 8% effective is ₹ 10,000. Find the size of each payment.*

a. ₹ 873.86 *b.* ₹ 108.60
c. ₹ 341.01 *d.* None of these

ICAI SM

(56) *Paul borrows ₹ 20,000 on condition to repay it with compound interest at 5% p.a. in annual instalment of ₹ 2,000 each. Find the number of years in which the debt would be paid off.*

a. 10 years *b.* 12 years
c. 14.2 years *d.* 15 years

ICAI SM

(57) *A person invests ₹ 500 at the end of each year with a bank which pays interest at 10% p.a C.I. annually. The amount standing to his credit one year after he has made his yearly investment for the 12th time is. [Given $(1.1)^{12} = 3.1384$]*

a. ₹ 11,761.36 *b.* ₹ 10,000
c. ₹ 12,000 *d.* none of these

Applications of TVOM & Other Concepts

<table>
<tr><td>Leasing</td><td>

Lessor: Owner of Asset, who gives asset on rent. Lease Rentals are income for Lessor
Lessee: User of the asset who has taken asset on rent. Lease Rentals are expense for Lessee
Use of TVOM: Present Value of Annuity (Lease Rentals) are compared with asset cash down price to decide if leasing is preferable or not.

</td></tr>
<tr><td>Capital Expenditure Decisions</td><td>

Present value of future benefits due to new asset are compared with purchase value of asset, to decide whether asset to purchase or not.

</td></tr>
<tr><td>Valuation of Bond</td><td>

Present value of interest income and maturity value is compared with the issue price of bond
Terms

<table>
<tr><td>Bond</td><td>It is a debt security. Type of loan taken by company from public. Like debentures</td></tr>
<tr><td>Face Value/ Par Value</td><td>Value written on the document of bond. This value is used to calculate Interest Amount</td></tr>
<tr><td>Issue Price</td><td>Actual payment made to purchase the bond</td></tr>
<tr><td>Maturity Value</td><td>Amount to be received on redemption or maturity of bond</td></tr>
</table>
</td></tr>
<tr><td>PV of Perpetuity</td><td>Perpetuity: An annuity that continues till infinite period of time is called as Perpetuity.
$$PVP = \frac{A_i}{i}$$
where, PVP = Present Value of Perpetuity, A_i = Annuity Value (Installment), i = adjusted interest rate</td></tr>
<tr><td>PV Growing Perpetuity</td><td>A stream of cashflows that grows at constant rate forever is known as growing perpetuity.
$$PVGP = \frac{A_i}{i-g}$$
PVGP = Present Value of Growing Perpetuity; A_i = Annuity Value (Installment); i = adjusted interest rate; g = growth rate</td></tr>
<tr><td>Net Present Value</td><td>
<table>
<tr><td>Formula</td><td>NPV = Present Value of Cash Inflows – Present Value of Cash Outflows</td></tr>
<tr><td>Decision Base</td><td>If NPV ≥ 0, accept the proposal,
If NPV < 0, reject the proposal</td></tr>
</table>
</td></tr>
<tr><td>Real Rate of Return</td><td>Real Rate of Return = Nominal Rate of Return – Rate of Inflation</td></tr>
<tr><td>CAGR</td><td>Compounded Annual Growth rate is used to show annual growth as per CI</td></tr>
</table>

MTP Nov 19

(58) *A company is considering proposal of purchasing a machine either by making full payment of ₹ 4000 or by leasing it for four years at an annual rate of ₹ 1250. Which course of action is preferable if the company can borrow money at 14% compounded annually? [P (4,0.14) = 2.9137]*

a. leasing is not preferable
b. leasing is preferable
c. cannot determined
d. none of these

PYQ June 19

(59) *A person wants to lease out a machine costing ₹ 5,00,000 for a 10 year period. It has fixed a rental of ₹ 51,272 per annum payable annually starting from the end of first year. Suppose rate of interest is 10% per annum compounded annually on which money can be invested. To whom this agreement is favourable?*

a. Favour of Lessee
b. Favour of Lessor
c. Not for both
d. Can't be determined

PYQ June 22

(60) *ABC Ltd. Wants to lease out an asset costing ₹3,60,000 for a five year period. It has a fixed rental of ₹ 1,05,000, per annum payable annually starting from the end of first year. Suppose rate of interest is 14% per annum compounded annually on which money can be invested by the company. Is this agreement favourable to the company.*

a. Yes *b. No*
c. It depends *d. None of these*

MTP May 19 Series II, ICAI SM

(61) *A machine can be purchased for ₹ 50,000. Machine will be contributing ₹ 12,000 per year for the next five years. Assuming borrowing cost is 10% per annum. Determine whether machine should be purchased or not*

a. Should be purchased
b. Should not be purchased
c. Can't say about purchase
d. none of the above

MTP Jun 23 – Series I

(62) *A machine with useful life of 7 years costs ₹ 10,000 while another machine with useful life of 5 years costs ₹ 8000. The first machine saves labour expenses of ₹ 1900 annually and the second one saves labour expenses of ₹ 2200 annually. Determine the preferred course of action. Assume cost of borrowing as 10% compounded per annum.*

a. 1st machine should be purchased
b. 2nd machine should be purchased
c. Information is not sufficient
d. None of these

ICAI SM

(63) *An investor intends purchasing a three year ₹1,000 par value bond having nominal interest rate of 10%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 14%?*

a. ₹ 907.125 *b. ₹ 1033.54*

c. ₹ 945.67 d. None of these

MTP Dec 2022 Series II

(64) *A ₹1000 bond paying annual dividends at 8.5% will be redeemed at par at the end of 10 years. Find the purchase price of this bond if the investor wishes a yield rate of 8%*

a. ₹ 907.135 b. ₹ 1033.54

c. ₹ 945.67 d. None of these

PYQ June 19

(65) *Determine the present value of perpetuity of ₹ 50,000 per month @ rate of interest 12% p.a. is _____*

a. ₹ 45,00,000 b. ₹ 50,00,000

c. ₹ 55,00,000 d. ₹ 60,00,000

PYQ Nov. 20

(66) *A stock pays annually an amount of ₹ 10 from 6th year onwards. What is the present value of the perpetuity, if the rate of return is 20%?*

a. 20.1 b. 19.1

c. 21.1 d. 22.1

PYQ Jun 23

(67) *Mr. Sharad got his retirement benefits amounting to ₹ 50,00,000. He want to receive a fixed monthly sum of amount for his rest of life, starting after one month and thereafter he want to pass on the same to future generation. He expects to earn an interest of 9% compounded annually. Determine how much perpetuity amount he will receive every month?*

a. ₹ 39,500 b. ₹ 38,500

c. ₹ 37,500 d. ₹ 36,600

MTP Dec 22 – Series I

(68) *Assuming that the discount rate is 7% p.a. How much would you pay to receive ₹ 500. Growing at 5% annually forever?*

a. ₹ 2500 b. ₹ 5000

c. ₹ 7500 d. ₹ 25000

MTP Nov 21

(69) *If the cost of capital be 12% per annum, then the Net Present Value (in nearest Rs.) from the given cash flow is given as ₹ in thousands*

Year	0	1	2	3
Operating profit	(100)	60	40	50

a. ₹ 34,048 b. ₹ 34,185

c. ₹ 51,048 d. ₹ 21,048

MTP Oct 21

(70) *The nominal rate of growth is 17% and inflation is 9% for the five years. Let P be the Gross Domestic Product (GDP) amount at the present year then the projected real GDP after 6 years is*

a. 1.587P b. 1.921 P

c. 1.403 P d. 2.51 P

PYQ Jun 23

(71) *Ms. Paul invested ₹ 1,00,000 in a mutual fund scheme in January 2018. After one year in January 2019, she got a dividend amounting to ₹ 10,000 for first year, ₹ 12,000 for second year, ₹ 16,000 for third year, ₹ 18,000 for fourth year and ₹ 21,000 for fifth year in January 2023. What is Compounded Annual Growth Rate (CAGR) of dividend return? Given* $1.2038^4 = 2.1$.

a. 20.38% b. 18.59%
c. 16.36% d. 15.89%

MTP Nov 21

(72) *Arun purchased a vaccum cleaner by giving ₹1700 as cash down payment, which will be followed by five EMIs of ₹480 each. The vaccum cleaner can also be bought by paying ₹3900 cash. What is the approx. rate of interest p.a. (at simple interest) under this instalment plan?*

a. 18% b. 19%
c. 22% d. 20%

MTP May 20, ICAI SM

(73) *A person bought a house paying ₹ 20,000 cash down and ₹ 4,000 at the end of each year for 25 yrs. at 5% p.a. C.I. The cash down price is[Given* $(1.05)^{25} = 3.386355$ *]*

a. ₹ 75,000 b. ₹ 76,000
c. ₹ 76,375.80 d. none of these.

ICAI SM

(74) *Johnson left ₹ 1,00,000 with the direction that it should be divided in such a way that his minor sons Tom, Dick and Harry aged 9, 12 and 15 years should each receive equally after attaining the age 25 years. The rate of interest being 3.5%, how much each son receive after getting 25 years old?*

a. 50,000 b. 51,994
c. 52,000 d. 51,947

ICAI SM

(75) *Appu retires at 60 years receiving a pension of 14,400 a year paid in half-yearly installments for rest of his life after reckoning his life expectation to be 13 years and that interest at 4% p.a. is payable half-yearly. What single sum is equivalent to his pension?*

a. 1,45,000 b. 1,44,900
c. 1,44,800 d. 1,44,700

PYQ Dec 22

(76) *10 years ago the earning per share (EPS) of ABC Ltd. was ₹ 5 share. Its EPS for this year is ₹ 22. Compute at what rat, EPS of the company grow annually?*

a. 15.97% b. 16.77%
c. 18.64% d. 14.79%

PYQ Jun 23

(77) *Suppose you have decided to make a Systematic Investment Plan (SIP) in a mutual fund with ₹ 1,00,000 every year from today for next 10 years where you get return at the rate of 10% per annum compounded annually. What is the future value of this annuity? Given* $1.1^{10} = 2.59374$

a. ₹ 17,35,114 b. ₹ 17,53,411
c. ₹ 17,35,411 d. ₹ 17,53,114

Answer Key		
1 b	2 c	3 a
4 b	5 c	6 b
7 a	8 b	9 c
10 b	11 b	12 a
13 c	14 b	15 a
16 a	17 b	18 b
19 c	20 b	21 a
22 c	23 d	24 c
25 b	26 a	27 a
28 b	29 a	30 d
31 c	32 a	33 c
34 c	35 d	36 b
37 c	38 c	39 a
40 a	41 a	42 d
43 a	44 a	45 a
46 d	47 a	48 b
49 c	50 b	51 b
52 a	53 b	54 a
55 c	56 c	57 a
58 b	59 a	60 a
61 b	62 b	63 a
64 b	65 b	66 a
67 c	68 d	69 d
70 a	71 a	72 c
73 c	74 d	75 b
76 a	77 d	