CHAPTER-4

TIME VALUE OF MONEY

SIMPLE INTEREST:

$$SI = Pni = \frac{Pnr}{100}$$

$$A = P + I$$

Here,

SI = simple interest

P = Principal

R = Rate of interest

i = Rate of interest in decimal.

n = no. of years.

A = Accumulated amount.

COMPOUND INTEREST:

$$CI = P[(1+i)^n - 1]$$

$$A = P(1+i)^n$$

When interest is compounded monthly, quarterly or half yearly, then 'i' should be divided by 't' and 'n' should be multiplied with 't'.

Here,

CI = Compound interest

P = Principal

i = Rate of interest in decimal

n = no. of years

A = Accumulated amount

t = Number of conversion period in a year.

EFFECTIVE RATE:

* Effective interest rate can be defined as the equivalent annual rate of interest compounded annually if interest is compounded more than once a year.
* Effective rate of interest arrises only when interest is compounded monthly, quarterly, half-yearly.
* Effective rate of interest is defined as the actual interest paid / received for ₹ 100 because of compounding monthly, quarterly and half-yearly.

NOMINAL RATE OF INTEREST = $CI = P[(1+i/t)^{t}-1]$

EFFECTIVE RATE OF INTEREST = $E = (1+i/t)^{nt}-1$

COMBINED FORMULA = $I = PEn$

* Nominal rate of interest will be less than effective rate of interest.
* The difference is very very marginal.
* Maximum difference is 0.5.
* If interest is compounded anually, then NROI = EROI.
* For simple interest, effective rate of interest doesn't arrive, but we can say EROI = NROI
* Effective rate of interest is not related to the amount of principal.
* It is related to the interest rate & frequency of compounding the interest.
* If effective rate of interest is less than the simple interest rate of interest, then it is better to invest in simple interest.

ANNUITY:

* Annuity can be defined as a sequence of periodic payments or receipts regularly over a specific period of time.
* To be called annuity a series of payments or receipts must have the following features:
  i> Amount paid (or received) must be constant over the period of annuity.

ii) Time interval between two consecutive payments (or receipts) must be the same.

TYPES OF ANNUITY:

1) ANNUITY REGULAR:

* In annuity regular, first payment / receipt takes place at the end of first period.

2) ANNUITY DUE OR ANNUITY IMMEDIATE:

* In annuity due or annuity immediate, first payment / receipt takes place at the begining of first period.

FUTURE VALUE:

1) FUTURE VALUE OF SINGLE CASH FLOW (INVESTMENT):

$$F = CF\ (1+i)^n$$

2) FUTURE VALUE OF ANNUITY REGULAR:

$$A(n,i) = \frac{A}{i}\left[(1+i)^n - 1\right]$$

3) FUTURE VALUE OF ANNUITY DUE:

$$A(n,i) = \frac{A}{i}\left[(1+i)^n - 1\right](1+i)$$

$A(n,i)$ = Table value of $A(n,i)$ × Annuity.

where,

$A(n,i)$ = Future value of annuity / amount of annuity / accumulation at the end of the year.

A = Yearly annuity.

PRESENT VALUE:

1, PRESENT VALUE OF SINGLE CASH FLOW:

$$P = \frac{A}{(1+i)^n}$$

$$A = P(1+i)^n$$

2, PRESENT VALUE OF REGULAR ANNUITY:

$$PV = \frac{A}{i}\left[1 - \frac{1}{(1+i)^n}\right]$$

$$P(n,i) = \frac{\left[1 - \frac{1}{(1+i)^n}\right]}{i}$$

$$\Rightarrow PV = A \times P(n,i)$$

$$A = \frac{PV}{P(n,i)}$$

3, PRESENT VALUE OF ANNUITY DUE:

$$PV = \frac{A}{i}\left[1 - \frac{1}{(1+i)^{n-1}}\right] + A$$

where,

PV = Present value

A = Annuity.

POINTS TO REMEMBER:

* Annuity is made now, paid today, made at once, started today refers to annuity due or annuity immediate.
* Table value is applicable only for compounding yearly
* If annuity is yearly, then interest should be compounded yearly.
* It is always advisable to check periodicity of annuity and mode of compounding are same.
* In compound interest problem only one deposit is made, but in annuity problem, every year deposits are made. By comparing this, we can identify, whether the problem is compound interest or annuity problem.

* If the question reads amount of annuity or future value of annuity, then the given annuity is towards saving purpose.
* If the question reads present value of annuity, then the given annuity is towards repayment purpose.
* Loan amount, cash price, lump sum, single sum replacing the installment amount, ready money indicates present value.
* Present value of single cash flow = $\frac{An}{(1+i)^n}$.
where, for positive i the factor $1/(1+i)^n$ is always less than 1 indicating thereby future amount has smaller value.

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.

$$A(n,i) = A/i\left[(1+i)^n - 1\right]$$

LEASING:

* Leasing is a financial arrangement under which the owner of the asset (lessor) allows the user of the asset (lessee) to use the asset for a defined period of time (lease period) for a consideration (lease rental) payable over a given period of time.
* This is a kind of taking an asset on rent.
* To decide whether a lease agreement is favourable or not, we have calculate the present value and then we have to compare the present value & initial cost of asset.
* If the present value is higher, then leasing is favourable to the lessor.
* If the initial cost is higher, then leasing is favourable to the lessee.

CAPITAL EXPENDITURE (INVESTMENT DECISION):

* Capital expenditure means purchasing an asset (cash outflow) today in anticipation of benefit (cash inflow) which would flow across the life of the investment.
* If the present value of cash inflow is higher then the present value of cash outflow, then it is favourable.