31 may, 2024

Ch-3 Time Value of Money

* $SI = \frac{PRN}{100}$

$SI = A - P$

$A = P + SI = P + \frac{PRN}{100} = P(1 + \frac{RN}{100})$

Ex. P = 6000 5 % for R

SI = 6000 X 10 % = 600
A = 6000 + 10 % = 6600

2) 10,000 $\frac{64}{12}$ = 5.33 25,000

15000

$SI = \frac{PNR}{100}$

$15000 = \frac{10,000 \times 5.33 \times R}{100}$

R = 28.14 %

* $R = \frac{SI}{P.a} \times 100$

In SI, Amounts to double

$N = \frac{100}{R}$

Amounts to n times

$N = \frac{(n-1)100}{R}$

TRICK In SI, If sum amounts to n_1 times In T_1 years and n_2 time In T_2 years

then $\frac{T_1}{T_2} = \frac{n_1 - 1}{n_2 - 1}$

Ex In SI

5 times → 16 years = 4
8 times → ? " = 7

$\frac{16 \times 7}{4}$ = 28 years

For same SI, divided money in inverse ratio of effective rate of Interest for respective time Period

Compound Intrest :-

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

Where = $I = \frac{R}{100}$

$CI = A - P = P(1+i)^n - P = P((1+I)^n - 1)$

Ex. $P = 5000$, $R = 7.5\%$, $N = 3$ years

$A = 5000$
$+ 7.5\%$ 3 times
6211.48
$- 5000$
1211.48

Compounded m-times year

~~$A = P \times (1 \times i$~~

$A = P \times \left(1 + \frac{I}{m}\right)^{nm}$

Ex. 2) $P = 18{,}000$ 24 % Pa monthly 3 year

$\frac{i}{m} = \frac{0.24}{12} = 0.02$

~~36717.9~~ $= 18000 \times (1.02)^{36}$
36717.9

* Relation Between SI and CI

For 1 year, SI = CI

For 2 year, $CI_2 - SI_2 = P \times i^2$

For 3 year, $CI_3 - SI_3 = PI^2(3+I)$

For 2 years $\frac{SI_2}{CI_2} = \frac{200}{200+R}$

Compound Interest for Double or Tripple money

Rule 72

A sum of money double itself in approximately $\frac{72}{R}$ yrs

Rule 114

A sum of money triple itself in approximately $\frac{114}{R}$ yrs.

* For CI

In CI

→ n times ⟶ t yrs (m×t) year

n^m times ⟶ mt

Ex. 2 times ⟶ 3 yrs

2^4 16 times ⟶ 4×3 = 12 yrs

* Effective Rate of Interest :-

$$ERI = \left[\left(1+\frac{i}{k}\right)^k - 1\right] \times 100$$

Where = $I = \frac{R}{100}$ compounded k-times

Ex.

i) R = 12 % quart.

$$ERI = \left[\left(1+\frac{0.12}{4}\right)^4 - 1\right] \times 100$$

= 12.55 %

→ ERI convert given CI Rate in SI

→ ERI is calculated for rate of In

* Annuity

is defined as Series of equal Payments Which are made at Regular interval of time.

→ Time duration of annuity is called term or status

→ Unless otherwise stated, that first Payment will fall due at the end of year.

Known as ordinary annuity

→ When Payment fall due at the bein[illegible] of every year, it is called immediate annuity / annuity due. [From today / n[illegible]

→ When the Status of annuty is not f[illegible]

i.e the Payment is ~~to~~ ~~conti~~: ~~no~~' to [illegible] continues for an infinite periods a[illegible] Know as Perpentual annuity (Forever)

★ PRESENT Value :- (Loan / EMI)

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

Where:

V = Loan / Present value
P = Instalment
Cash down = down Payment + Loan

i) Ex. P = 50,000
Years = 15
R = 8 %

$$50{,}000 \times \frac{\left[1 - \frac{1}{(1.08)^{15}}\right]}{0.08}$$

V = 427973.93

ii) Loan = 10 L, 10 years, 12 % p.a half
Every 6 month Instalment

$$10L = P \times \frac{\left[1 - \frac{1}{(1.06)^{20}}\right]}{0.06}$$

P = 67,184.55

Ex. 3 20 L → Down Payment
Instalment 50,000 Every for 18 yrs 12 % p.a

$$= \frac{50000 \times 1 - \frac{1}{(1.12)^{18}}}{0.12}$$

= 3,62,483.50 → Loan

Cash down = down Payment + Loan
= 20,00,000 + 3,62,483.50
= 23,62,483.50

★ FOR PERPETUAL Annuity

$$V = \frac{P}{i} = \frac{P}{DR - GR}$$

When DR = Discount Rate
GR = Growth Rate

Note

$$V = P\frac{\left(1 + \frac{1}{(1+i)^n}\right)}{i} = P \times P(n, i)$$

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