CHAPTER - 4.

TIME VALUE OF MONEY.

EXERCISE 4(A)

1. $P = ₹ 3,500$

$n = 3$ years

$r = 12\%$.

$$SI = \frac{Pnr}{100} = \frac{3,500 \times 3 \times 12}{100} = 1,260.$$

Ans: (b) ₹ 1,260.

2. $P = 5,000$

$R = 15\%$.

$T = 4\frac{1}{2} = 9/2$

$$I = \frac{PRT}{100} = \frac{5,000 \times 9 \times 15}{100 \times 2} = 3375.$$

Ans: (a) ₹ 3,375

3. $P = 5,000$

$T = 1$

$I = 300$

$$I = \frac{PRT}{100}$$

$$300 = \frac{5,000 \times 1 \times R}{100}$$

$$R = \frac{300}{50}$$

$$R = 6\%.$$

Ans: c, 6%.

4, $P = ₹ 4,500$

$A = ₹ 7,200$

$I = A - P = 7,200 - 4,500 = ₹ 2,700.$

Ans: d, 2,700.

5, $P = ₹ 12,000$

$A = ₹ 16,500$

$T = 2\frac{1}{2}$ years $= 5/2$ years.

$I = A - P = 16,500 - 12,000 = 4,500.$

$$I = \frac{PRT}{100}$$

$$4,500 = \frac{12,000 \times 5 \times R}{100 \times 2}$$

$$R = \frac{4,500}{300}$$

$$R = 15\%.$$

Ans: a, 15%.

6) $P = ₹10,000$

$I = ₹2,500$

$R = 12\frac{1}{2}\% = 25/2\%$

$$I = \frac{PRT}{100}$$

$$2,500 = \frac{\cancel{10,000}^{50} \times 25 \times T}{\cancel{100} \times 2}$$

$$T = 2$$

Ans: b) 2 years.

7. $P = ₹8,500$

$A = ₹10,200$

$R = 12\frac{1}{2}\% = 25/2$

$I = A - P = 10,200 - 8,500 = 1,700.$

$$I = \frac{PRT}{100}$$

$$1,700 = \frac{8,500 \times 25 \times T}{100 \times 2}$$

$$T = \frac{1,700 \times 2}{85 \times 25}$$

$T = 1.6$ years

$T = 19.2$ months. $(1.6 \times 12 = 19.2)$

$T = 1$ yr. 7mth

Ans: a) 1yr. 7mth.

8, $I = 1,200$.

$R = 18\%$

$n = 1/12$

$$I = \frac{PnR}{100}$$

$$1,200 = \frac{P \times 1 \times 18}{100 \times 12}$$

$$1,200 = \frac{3P}{200}$$

$$P = \frac{1,200 \times 200}{3}$$

$P = 80,000$.

Ans: c, P = ₹ 80,000.

9, $I = 7,400 - 6,200 = 1,200$.

$A = P + I$

$6,200 = P + 2,400$

$P = 3,800$.

$$I = \frac{PnR}{100}$$

$$1,200 = \frac{3,800 \times 1 \times R}{100}$$

$R = 31.57\%$.

Ans: a, ₹ 3,800 , 31.57%.

10, $P = \frac{P \times 10 \times R}{10}$

$R = 10\%$.

$I = \frac{PnR}{100}$

$2P = \frac{P \times 10 \times n}{10}$

$n = 20$ years.

Ans: c, 20 years.

EXERCISE 4(B):

1. $P = ₹1,000$

$R = 5\%$ $\Rightarrow i = 0.05$

$n = 4$.

$A = P[1+i]^n$

$A = 1,000\,[1+0.05]^4$

$A = 1,215.5062$.

$I = A - P$

$I = 1,215.5062 - 1,000$

$I = 215.5062$.

Ans: a, ₹1,215.50, ₹215.50.

2, $P = ₹100$

$n = 20$ years

$R = 5\%$

$i = 0.05$

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

$I = 100[(1+0.05)^{20} - 1]$

$I = 100[1.6532964]$

$I = 165.32964$

Ans: c, ₹165.33

3, $E = (1+i)^n - 1$

$E = (1 + \frac{0.03}{2})^2 - 1$

$E = 3.0225\%$

Ans: c, 3.0225% P.a

4, Net worth value = Initial value $\times (1-i)^n$

$30,000 = 1,00,000 (1-0.2)^n$

$0.3 = 0.8^n$

$(0.8)^{5.4} = 0.8^n$

$\Rightarrow n = 5.4$

Ans: b, 5.4 years (appx.)

5,

$A = ₹1,000$.

$n = 2$ years.

$R = 6\%$.

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

$$1,000 = P\left(1+\frac{0.06}{2}\right)^{2\times 2}$$

$$P = \frac{1,000}{1.1255088}$$

$$P = 888.48705.$$

Ans: a, ₹ 888.50.

6,

$$(1+2\%)^t = (1+40\%)$$

$$\left(1+\frac{2}{100}\right)^t = \left(1+\frac{40}{100}\right)$$

$$1.02^t = 1.4.$$

$$1.02^t = (1.02)^{17}$$

$$\Rightarrow t = 17$$

Ans: c, 17 years (app).

7, $110.16 = P[(1+i)^n - 1] - Pni$

$110.16 = P[(1+0.06)^3 - 1] - P(3)(0.06)$

$110.16 = 0.191016P - 0.18P$

$110.16 = 0.011016P$

$P = \frac{110.16}{0.011016}$

$P = 10,000.$

Ans: d, ₹ 10,000.

8. Net worth value = Initial value $\times (1-i)^n$

$= 10,000 \times (1-0.1)^{10}$

$= 3486.784.$

Ans: a, ₹ 3,486.78.

9, $E = (1+i)^n - 1$

$= (1+\frac{0.07}{4})^4 - 1$

$= 0.0718589$

$= 7.18589\%$.

Ans: d, 7.18%.

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

$= 16,000[(1+0.05)^3 - 1]$

$= 2,522$.

Ans: b, ₹ 2,522.

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

$= 40,000\left[\left(1+\frac{0.1}{4}\right)^4 - 1\right]$

$= 4,152.512$

Ans: c, ₹ 4,152.51.

12, Difference $= P[(1+i)^n - 1] - Pni$

$= 2,400[(1+0.05)^2 - 1] - 2,400 \times 0.05 \times 2$

$= 246 - 240$.

$= 6$.

Ans: d, ₹6

13, $n = 70/R$

$= 70/39.4 - 19.4$

$= \frac{70}{20}$ normalised to 1,000.

$= \frac{70}{2}$

$= 35.$

Ans: a, 35 years.

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

$= 4,000\left[\left[1 + \frac{0.12}{4}\right]^{\frac{6}{12}\times 4} - 1\right]$

$= 4,000\,(0.0609)$

$= 243.6$

Ans: a, 243.60

EXERCISE 4(c):

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

$= \frac{3,000}{0.045}\left[1 - \frac{1}{(1+0.045)^{15}}\right]$

$= 66,666.67\left[1 - \frac{1}{1.9353}\right]$

$$= 66,666.67 \left[1 - 0.5167157\right]$$

$$= 32,218.954$$

Ans: b, 32,218.95

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

$$= \frac{150}{0.035}\left[(1+0.035)^{12} - 1\right]$$

$$= 2190.2942$$

Ans: a, 2190.28.

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

$$10,000 = \frac{A}{0.04}\left[-(1+0.04)^{-30} + 1\right]$$

$$400 = A\left[0.691681\right]$$

$$A = \frac{400}{0.691681}$$

$$A = 578.30.$$

Ans: c, 578.30

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

$= \frac{1,200}{0.08}\left[1 - \frac{1}{(1+0.08)^{12}}\right]$

$= 15,000\,[1 - 0.3971137]$

$= 9043.2945.$

Ans: d, ₹ 9,043.30.

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

$= \frac{100}{0.05}\left[(1+0.05)^{10} - 1\right]$

$= 2,000\,[0.628894]$

$= 1257.78.$

Ans: a, ₹ 1,258.

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

$50,000 = \frac{A}{0.05}\left[(1+0.05)^{25} - 1\right]$

$2,500 = A\,[2.38635]$

$A = 1047.5591$

Ans: b, ₹ 1,047.62

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

$$3,137.12 = \frac{100}{0.045}\left[(1+0.045)^n - 1\right]$$

$$1.411704 = 1.045^n - 1$$

$$2.411704 = 1.045^n$$

$$(1.045)^{20} = (1.045)^n$$

$$\Rightarrow n = 20.$$

Ans: b, 20 years (approx.)

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

$$10,000 = \frac{1,000}{0.05}\left[-(1+0.05)^{-n} + 1\right]$$

$$0.5 = 1 - (1.05)^{-n}$$

$$(1.05)^{-n} = 0.5.$$

$$\frac{1}{(1.05)^n} = 0.5.$$

$$\frac{1}{(1.05)^n} = \frac{1}{(1.05)^{14.2}}$$

$$\Rightarrow n = 14.2 \text{ years}.$$

Ans: a, 14.2 years.

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

$= 5,120\left[(1+0.125)^3 - 1\right]$

$= 2,170.$

Ans: b, ₹ 2,170.

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

$20,000 = \frac{2,000}{0.05}\left[-(1+0.05)^{-n} + 1\right]$

$0.5 = 1 - (1.05)^{-n}$

$(1.05)^{-n} = 0.5$

$\frac{1}{(1.05)^n} = 0.5$

$\frac{1}{(1.05)^n} = \frac{1}{(1.05)^{14}}$

$\Rightarrow n = 14$

Ans: d, 14.2 years.

11,

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

$$= \frac{500}{0.1}\left[(1+0.1)^{12} - 1\right]$$

$$= 10,692.14188.$$

Amount after one year of 12th installment

$$= 10.692.14 \times (1+i)$$

$$= 10.692.14 \times (1+0.1)$$

$$= 11,761.356$$

Ans: a, ₹ 11,761.36.

12,

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

$$= \frac{5,000}{0.04}\left[-(1+0.04)^{-12} + 1\right]$$

$$= 46,925.3688$$

Ans: d, ₹ 46.925.40.

13, $V = \frac{a}{I}$

$= \frac{300}{0.1}$

$= 3,000$

Ans : c, ₹ 3,000.

EXERCISE 4(D) :

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

$5,200 = P(1+0.05)^6$

$5,200 = P(1.05)^6$

$P = \frac{5,200}{(1.05)^6}$

$P = 3,880.32$

Ans: b, ₹ 3,880.

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

$= 1,000[(1+0.05)^4 - 1]$

$= 1,000[0.2155]$

$= 215.50.$

Ans: a, ₹ 215.50

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

$2P = P(1+0.05)^n$

$2 = 1.05^n$

$(1.05)^{14.2} = 1.05^n$

$\Rightarrow n = 14.2$

Ans: c, 14.2 years.

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

$10,000 = P(1+0.04)^{18}$

$10,000 = P(2.02581)$

$P = 4936.2970$

Ans: d, ₹ 4,936.30

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

$3P = P(1+0.08)^n$

$3 = (1.08)^n$

$(1.08)^{14.28} = (1.08)^n$

$\Rightarrow n = 14.28$

Ans: a, 14.28 years

6,

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

$$= \frac{80}{0.05}\left[-(1+0.05)^{-20}+1\right]$$

$$= 996.9768$$

Ans: a, ₹ 997 (appx.)

7.

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

$$= \frac{4,000}{0.05}\left[-(1+0.05)^{-25}+1\right]$$

$$= 56,375.7782.$$

Cash down price = 20,000 + 56,375.78.

= 76,375.78

Ans: c, 76,375.80

8)

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

$$1,00,000 = \frac{A}{\frac{0.12}{2}}\left[-\left(1+\frac{0.12}{2}\right)^{-20}+1\right]$$

$$6.000 = A\left[0.688195\right]$$

$$A = \frac{6,000}{0.688195}$$

$$A = 8,718.4591$$

Ans: a, ₹ 8,718.45