Mucharla Harsha Vardhan, 49, A

Assignment-II

1) Given,

Loan amount (C) = 20,000 ; Term = 5 years ;

Monthly installments (x) = 427.90 ; Payment is in arrears.

(i) Then, $20,000 = (12 \times 427.9)\, a^{(12)}_{\overline{5|}}$ @ i

$$\Rightarrow a^{(12)}_{\overline{5|}} = \frac{20,000}{12 \times 427.9} = 3.89499$$

It is known that APR ~ 2× Flat Rate.

$$\text{Flat Rate} = \frac{\text{Interest}}{\text{Loan Amount} \times \text{Term}}$$

$$= \frac{-20,000 + 5 \times 12 \times 427.9}{20,000 \times 5}$$

$$= 5.67\%$$

∴ APR ~ 11.34%

At APR = 10% $\Rightarrow a^{(12)}_{\overline{5|}}$ @ $i = 10\%$ = 3.96155

At APR = i $\Rightarrow a^{(12)}_{\overline{5|}}$ @ i = 3.89499

At APR = 12% $\Rightarrow a^{(12)}_{\overline{5|}}$ @ $i = 12\%$ = 3.8

By linear Interpolation we have APR = 10.8%

(ii) By Prospective method,

$$\text{Capital Outstanding after 1 year} = (12 \times \overset{427.9}{274.49})\, a^{(12)}_{\overline{4}|} \ @\ i = 10.8\%$$

$$= 16,775.977$$

The outstanding amount of ₹ 16,775.977 is being restructured with new monthly payments (Y) = ₹ 274.49 for t years (say) @ i = 10.8%.

Then,
$$16,775.977 = (12 \times 274.49)\, a^{(12)}_{\overline{t}|} \ @\ i = 10.8\%$$

$$\Rightarrow \frac{1 - (1.108)^{-t}}{12\left[1.108^{1/12} - 1\right]} = \frac{16775.977}{12 \times 274.49}$$

$$\Rightarrow (1.108)^{-t} = \cancel{0.418205}\ 0.475433$$

$$\Rightarrow t = -\frac{\log(0.418205)}{\log(1.108)} =$$

$$\Rightarrow t = 7.25 \text{ years.}$$

Therefore there are 7.25 years left after restructuring the loan.

(iii) Excess Interest = Total interest on original loan − Total interest on restructured loan.

Total interest on original loan:

$= 12 \times 4 \times 427.9 - 16775.977$

$= 3763.223$

Total interest on restructured loan $= 12 \times 7.25 \times 274.49 - 16775.977$

$= 7104.653$

Therefore Excess interest paid in restructured loan is

₹7104.653 − ₹3763.223 = ₹3341.421/-

3) At 1st November 1985,

$$PV_1 = 200 \times \ddot{a}_{\overline{22}|} \text{ @ } i = 8\% \times (1.08)^{-\frac{3}{12}}$$

$$= 200 \times 10.2007 \times (1.08) \times (1.08)^{-\frac{1}{4}}$$

$$= 2161.3633$$

$$PV_2 = 320 \times a^{(4)}_{\overline{16.25}|} \text{ @ } i = 8\% \times (1.08)^{\frac{1}{12}}$$

$$= 320 \times 1.029519 \times \frac{1-(1.08)^{-16.25}}{0.08} \times (1.08)^{1/12}$$

$$= 2957.8644$$

$$PV_3 = 180 \times a^{(12)}_{\overline{18.75}|} \text{ @ } i = 8\%$$

$$= 180 \times \frac{1-(1.08)^{-18.75}}{12\left[(1.08)^{1/12} - 1\right]}$$

$$= \cancel{17..} \quad 1780.6567$$

4) We know that,

$$(I\ddot{a})_{\overline{n}|} = 1 + 2v + 3v^2 + \cdots + nv^{n-1} \quad - \text{①}$$

$$\Rightarrow v(I\ddot{a})_{\overline{n}|} = v + 2v^2 + 3v^3 + \cdots + nv^n \quad - \text{②}$$

① - ②, we have,

$$\Rightarrow (1-v)(I\ddot{a})_{\overline{n}|} = 1 + v + v^2 + v^3 + \cdots + v^{n-1} - nv^n$$

$$\Rightarrow (1-v)(I\ddot{a})_{\overline{n}|} = \ddot{a}_{\overline{n}|} - nv^n$$

$$\Rightarrow (I\ddot{a})_{\overline{n}|} = \frac{\ddot{a}_{\overline{n}|} - nv^n}{d}$$

5) (i) Time-Weighted rate of Return for Property Fund

$$TWRR = \frac{16.4}{12.4} - 1 = 32.258\%$$

Time-Weighted rate of Return for Equity Fund

$$TWRR = \frac{15.5}{12.1} - 1 = 28.099\%$$

(ii)

b)

(i) Initial amount of Capital Repayment $= \dfrac{160,000}{a_{\overline{10|}}}$ @ $i = 8\%$ p.a.

$$= \frac{160000}{6.7101}$$

$$= 23844.652$$

(ii) After 4^{th} repayment, the capital outstanding

$$= 23844.652 \; a_{\overline{6|}} \quad @ \; i = 8\%$$

$$= 23844.652 \times 4.6229$$

$$= 110231.4422$$

But now i changed from 8% to 10%. So,

New repayment amount $= \dfrac{110231.4422}{a_{\overline{6|}}}$ @ $i = 10\%$

$$= \frac{110231.4422}{4.3553}$$

$$= 25,309.72428$$

(iii) Capital outstanding after 7^{th} repayment $= 25309.72428 \times a_{\overline{3}|}$ @ $i = 10\%$

$= 25309.72428 \times 2.4869$

$= 62942.75331$

Now, 'i' changed from 10% to 9%. so new repayment amount $= \dfrac{62942.75331}{a_{\overline{3}|}}$ @ $i = 9\%$

$= \dfrac{62942.75331}{2.5313} = 24865.78174$

7) (i) Reasons:-

a) Property is less liquid than government security

b) Investing in Govt. security provides guaranteed coupon payment.

c) There are extra expenses incurred after purchasing property.

(ii)

c)

1) Debentures :-

The investor may not receive income if the company does not pay interest.

2) Equity Shares:-

The investor will not have a guarantee of certain income as dividends change with respect to dividend policy of a Company.

3) Property:-

It is related to availability of demand for property rentals.

9)

(i) ~~T~~ TWRR :-

$$(1+i)^3 = \frac{33}{30.5} \times \frac{41.05-4.5}{33+6} \times \frac{45.6}{41.05} \times \frac{47}{45.6-2.5}$$

$$\Rightarrow (1+i)^3 = 1.2283132$$

$$\Rightarrow i = 7.095\%$$

MWRR :-

$$47 = 30.5(1+i)^3 + 6(1+i)^{2.25} + 4.5(1+i)^{1.5} - 2.5(1+i)^{0.5}$$

At $i = 7\%$, $AV = 46.745$

$i = 8\%$, $AV = 48.008$

By linear interpolation, we have, $MWRR = i = 7.2\%$

(iii)

(ii) Linked rate of Return :-

$$(1+i)^3 = \left[1+\left(\frac{38.5-30.5}{30.5}\right)\right]\times\left[1+\left(\frac{45-38.5}{38.5}\right)\right]\times\left[1+\left(\frac{47-45}{45}\right)\right]$$

$$\Rightarrow (1+i)^3 = 1.5409836$$

$$\Rightarrow i = LIRR = 15.504\%$$

10) Given,
(i) First Installment = ₹ 2,00,000/- = P (say)
Increment in subsequent years = ₹ 20,000/- = Q (say).

Then, let the approved loan amount = X.

Then,

$$PV = (P-Q)\,a_{\overline{n}|} + Q\,(Ia)_{\overline{n}|}.$$

$$\Rightarrow X = 180000\,a_{\overline{15}|} + 20{,}000\,(Ia)_{\overline{15}|} \quad @\ i = 12\%$$

$$\Rightarrow X = ₹\,20{,}40{,}582.$$

Then, Total Cost of the house $= \dfrac{20{,}40{,}582}{80\%} = ₹\,25{,}50{,}727.5$/-

(ii) Loan Schedule :-

Year	Loan O/S at beginning	Repayment Installment	Interest Paid	Capital Repaid	Loan O/S at end
9	18,75,852	3,60,000	2,25,102.24	134897.76	1740954.24
10	17,40,954.24	3,80,000	2,08,914.51	171085.49	1569868.75

Working notes :-

At year 9 :-

Installment amount = $2,00,000 + (9-1)(20,000) = 3,60,000$

Loan O/S at beginning = $PV_{t=8} = 3,40,000\, a_{\overline{7}|} + 20,000\, (Ia)_{\overline{7}|}$

$= 1875\,852$

At year 10 :-

Installment amount = $3,60,000 + 20,000 = 380000$

Loan O/S at beginning = ~~$-(1875852 \times 12\%) + 8$~~

~~3,60,000~~

$= 18\,75,852 - \left(3,60,000 - (1875\,852 \times 12\%)\right)$

$= 17\,40954.24$

11)
(i) Let X be the value of fund on 31/12/16.

Then,

$$(1.20)^2 = \frac{500}{460} \times \frac{550}{500} \times \frac{600}{550} \times \frac{X}{600}$$

$$\Rightarrow X = 662.4$$

(ii) <u>MWRR</u>:-

$$662.4 = 460(1+i)^2 + 40(1+i)^{\frac{21}{24}} - 50(1+i)$$

$$\Rightarrow i = 21.19\%$$

(iii) <u>Linked rate of return</u>:-

$$(1+i)^2 = \left(1 + \left(\frac{550-460}{460}\right)\right)\left(1 + \left(\frac{662.4-550}{550}\right)\right)$$

$$\Rightarrow (1+i)^2 = 1.44 \Rightarrow i = 20\%$$

LIRR = 20%

13)

(i) Let monthly repayment be X.

Then, $9,88,000 = 12X\, a^{(12)}_{\overline{25}|}$ @ $i = 7\%$

$$= 12X\left(\frac{1-(1.07)^{-25}}{12\left[(1.07)^{1/12}-1\right]}\right)$$

$$\Rightarrow X = 82176.89243 \times \frac{1}{12}$$

$$= 6848.07437$$

(ii) Let the required loan O/S amount be X. Then,

$$X = 6848.07437\, a_{\overline{136}|} \;@\; \frac{i^{(12)}}{12}$$

$$\Rightarrow X = 6,48,5\cancel{7}7.7278$$

(iii) PV at 10/09/2026 $= 6848.07437\, a_{\overline{166}|} \;@\; \frac{i^{(12)}}{12}$

$= 7,36,123.4837$

PV at 10/10/2026 $= 6848.07437\, a_{\overline{165}|} \;@\; \frac{i^{(12)}}{12}$

$= 733437.5845$

Capital repaid $= 736123.4837 - 733437.5845 = ₹2685.909224$