FM ASSIGNMENT 2 →

Q.1)

$$20{,}000 = 12 \times 427.90\, a_{\overline{5}|}^{(12)}$$

$$\frac{20{,}000}{12 \times 427.90} = a_{\overline{5}|}^{(12)} = \frac{1-(1+i)^{-5}}{i^{(12)}} = \frac{1-(1+i)^{-5}}{12\left((1+i)^{1/12}-1\right)}$$

$$3.894991042 = \frac{1-(x)^{-5}}{12\left((x)^{1/12}-1\right)}$$

$$x = 1+i \approx 1.108$$

$$i \approx 10.8\%$$

• Flat rate $= \dfrac{\text{TOTAL INTEREST}}{\text{orignal loan} * \text{term of loan}}$.

$$= \frac{\text{TOTAL REPAYMENT} - 20{,}000}{20{,}000 \times 5} = \frac{25{,}674 - 20{,}000}{1{,}00{,}000}$$

Flat rate $= 5.674\%$.

• APR $\approx 2 *$ Flat rate $\approx 11.3\%$.

$20{,}000(1.108) = 12 \times 274.49\, a_{\overline{x}|}^{(12)}$ @ $i = 10.8\%$.

$$\frac{20{,}000(1.108)}{274.49 \times 12} = \frac{1-(1.108)^{-x}}{12\left((1.108)^{1/12}-1\right)} = \frac{1-(1.108)^{-x}}{0.1029960}$$

$$6.727628 \times 0.102996 = 1-(1.108)^{-x}$$

$$x = 11.5132$$

Time for loan $= 11.5132$ years.

the new installment →

Interest on original loan = 5674.

• Restructured loan = $11.51 \times 274.49 \times 12 - 20{,}000(1.108)$

$= 15719.6232$

~~more interest~~

Q.2) (i) **Discounted Payback Period →**

The discounted payback period is a capital budgeting procedure used to determine the profitability of a project. A Discounted Payback Period (DPP) gives the no. of years it takes to break even ~~for~~ from undertaking the initial expenditure by discounting future cashflows and recognising the time value of money.

Payback Period →

~~They~~ The Payback Period is the time you need to recover the cost of your investment. In simple terms, it is the time an investment takes to reach the break even ~~pt.~~ point.

(ii) The net present value method evaluates a capital project in terms of its financial return over a ~~spect~~ specific time period, whereas the payback method is concerned with the time that will elapse a project repays the complete ~~the~~ initial investment, unlike the NPV.

(iii) **PROJECT A →**

	−170k	+20k	+20k	+200k
Time	0	1	2	3
		−20k	−10k	

• **NPV** at $i = 6\%$.

$$NPV_A = -170k + \cancel{20k}v - \cancel{20k}v + 20kv^2 - 10kv^2 + 200kv^3$$

$$= -170k + 10k \times v^2 + 200kv^3 = ₹\,6823.821$$

• FOR IRR, NPV = 0

$\cancel{17k}$ $-170k + 10k\,v^2 + 200k\,v^3 = 0$

$-17 + (1+i)^{-2} + 20(1+i)^{-3} = 0$

$i = 7.4\%$

$IRR_A = 7.4\%$

#PROJECT B →

-200k	14k	14k	14k	14k	14k	14k + 200k.
0	1	2	3	4	5	6

• $NPV_B = -200k + 14k\,a_{\overline{6}|} + 200k\,v^6 = \underline{\underline{9834.308}}$

• FOR IRR_B

$NPV = 0$

$$-200k + 14k\left(\frac{1-(1+i)^{-6}}{i}\right) + 200k\,v^6 = 0$$

$i = 7\%$

$IRR_B = 7\%$

maximum interest rate the bank can change is upto the IRR of both the projects.

Q.3) annuity 1 →

$PV = 200\,\ddot{a}_{\overline{22}|} @ 6\% * v^{0.25} = 200 * a_{\overline{22}|} * \frac{i}{d} * (1.06)^{0.25} = 2515.8893$

annuity 2 →

$PV = (320\,\ddot{a}^{(4)}_{\overline{16}|} + 80(1.06)^{-16})\,v^{0.25} = 3336.8$

annuity 3 → $PV = \frac{180}{12}\,\ddot{a}_{\overline{22}|} @ \frac{i^{12}}{12} = \cancel{180}\,\frac{280}{12}\left(\frac{1-(1.0048675)^{-225}}{0.0048675}\right)$

$= 2058.1301$

X be the new installment $\Rightarrow$

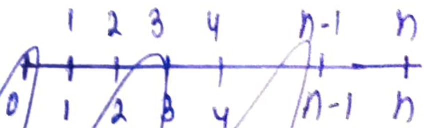
$X \ddot{a}^{(2)}_{\overline{22}|} @ 6\% = 2515.8893 + 3336.8 + 2058.1301$

$X a_{\overline{22}|} * \frac{i}{d^{(2)}} = 7910.8194$

$X(12.0410)(1.044782) = 7910.81948$

$\Rightarrow X = 628.7986431$

Q.4) ~~I~~ arrears $\Rightarrow$



$PV_0 = v + 2v^2 + 3v^3 + \dots + nv^n \dots (i)$

Ian

~~at~~ $I\ddot{a}_{\overline{n}|}$

$I\ddot{a}_{\overline{n}|} = 1 + 2v + 3v^2 + 4v^3 + \dots + nv^{n-1}$

$vI\ddot{a}_{\overline{n}|} = 1v + 2v^2 + \dots + (n-1)v^{n-1} + nv^n$

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

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

Q·5) (i) TWRR: Property fund

$$(1+i) = \frac{13 \cdot 1}{12 \cdot 4} \times \frac{14 \cdot 8}{13 \cdot 1} \times \frac{15 \cdot 8}{14 \cdot 8} \times \frac{16 \cdot 4}{15 \cdot 8}$$

$i = 32 \cdot 26\%$.

TWRR: equity fund.

$$(1+i) = \frac{\cancel{9 \cdot 2}}{12 \cdot 1} \times \frac{\cancel{10 \cdot 2}}{\cancel{9 \cdot 2}} \times \frac{\cancel{13 \cdot 1}}{\cancel{10 \cdot 2}} \times \frac{15 \cdot 5}{\cancel{13 \cdot 1}}$$

$i = 1 \cdot 280991 - 1$

$i = 28 \cdot 0991\%$.

Q·6)

(i) $160{,}000 = X\, a_{\overline{10}|} @ 8\%$.

$$X = \frac{160{,}000}{a_{\overline{10}|} @ 8\%}$$

$X = 23{,}844 \cdot 65209$.

(ii) loan outstanding after 4th installment $= PV_4$

$PV_4 = X\, a_{\overline{6}|} @ 8\%$.

$= 1{,}10{,}231 \cdot 4422$.

now 'i' is increased to 10%.

$1{,}10{,}231 \cdot 4422 = Y\, a_{\overline{6}|} @ 10\%$.

$Y = 25{,}309 \cdot 7242$.

(iii) $PV_7 = Y\, a_{\overline{3}|} @ 10\% = 62{,}942 \cdot 75331$.

now i is reduced to 9%.

let annual repayment = Z

$62{,}942.75331 = Z a_{3\rceil} @ 9\% = 24{,}865.78174.$

TOTAL amount repaid = $4X + 3Y + 3Z$

$= 2{,}45{,}905.126$.

$$(1+i)^{10} = \frac{245905.126}{1{,}60{,}000} = \cancel{1.43914}$$

$i = 4.3914\%$. [question number 7, 8, 9 on next page]

Q.10) (i) $P = 2{,}100{,}000$

$Q = 20{,}000$

$P - Q = 1{,}80{,}000$

let loan amount = X

$X = 180000\, a_{15\rceil} + 20{,}000\, Ia_{15\rceil}$

$X = 180000 \times 6.8109 + 20k \times 40.731 = 20{,}40{,}582.$

let the cost of house = C

$0.8C = 20{,}40{,}582.$

$C = 25{,}50{,}727.5.$

(ii) 9^{th} installment = $2{,}100{,}000 + 20{,}000 \times 8 = 360{,}000$.

loan O/S after 8^{th} installment

$PV8 = 340k\, a_{7\rceil} + 20k\, Ia_{7\rceil}$

$PV8 = 18{,}75{,}852.$

loan schedule.

~~year loan at start installment~~

year	loan at start	installment	interest	capital	loan o/s.
9	18,75,852	3,60,000	2,25,102.24	1,34,897.76	17,40,954.24
10	17,40,954.24	3,80,000	2,08,914.5	1,71,085.48	15,69,868.749.

(iii) 11^{th} installment = 2,00,000 + 20,000 × 10 = 4,00,000.

$PV_{10} = 380000\, a_{\overline{5}|} + 20000\, Ia_{\overline{5}|}$ --- (loan o/s after 10^{th} installment)

$= 380000(3.6048) + 20000(10.0018) = 15,69,860$

new loan amount = 15,69,860 + (1% of 15,69,860) = 15,85,558.6.

$15,85,558.6 = X\, a_{\overline{5}|} @ 10\%$.

$X = 4,18,264.9045$

total amount paid in ~~sen~~ scenario 1 = 200k + 220k + ... + 480k

$= \frac{15}{2}(200k + 480k) = 5100k$.

total amount paid in scenario 2 = 200k + 220k + ... + 380k + 4(X)

$= \frac{10}{2}(200k + 380k) + 4(418264.9043)$

$= 45,73,059.618$.

It is advisable for sum to transfer the loan to new bank as he pays less in installment i.e. total value paid by him in scenario 2 is less than that of scenario 1.

(QUESTN no. 11 on next pages)

Q.7) (i) Disadvantages→

(a) Low liquidity.
(b) Requires management & maintenance.
(c) Creates liabilities.

(iii) a) Tender usually refers to the process whereby government invite bids for large project that must be submitted within a finite deadline. A tender loan is a loan issued to a holder under special conditions. The type of loan is ~~issued~~ used to ensure the fulfillment of obligation based on the results of the tender.

b) Advantages of Bond tender offers→

(i) Decreasing the cost of capital.
(ii) Retiring the existing bonds at less than face value.
(iii) Does not affect the company's liquidity

Disadvantage→ Tender offers for buyback of any security, can be made without the consent of members of a company's board of directors. Such offers can represent the threat of a hostile takeover.

Q.8) 3 insecurities which have uncertain income.

(i) stocks: the return on equity are variable almost everyday as the markets rise and fall continuously. The investment income from stocks is very volatile.

(ii) Index linked bonds: In index linked bonds the amount never contain because it varies with inflation and hence cannot be ~~predict~~ predict.

(iii) Contingent annuities: In contingents annuities payments are made on a contingency such as survived or death. Hence payment is dependant on the happening of the event.

Q.9) (i) $(1+i)^3 = \frac{33}{30.5} \times \frac{38.5}{39} \times \frac{37}{38.5} \times \frac{45}{41.05} \times \frac{45.6}{45} \times \frac{47}{43.1} =$

$i = 7.53285\%$. (TWRR)

(MWRR)

$30.5(1+i)^3 + 6(1+i)^{26/12} = 47 + 4.5(1+i)^{1.5} - 2.5(1+i)^{0.5}$

$i = 7.23\%$.

(ii) LIRR, using for one year.

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

$(1+i)^3 = (1.262295082)(1.68831169)(1.04444)$

LIRR $= 30.567\%$.

(iii) MWRR is sensitive to amounts & timing of net cashflows. If, we are assessing the fund manager, this is not ideal, as the fund manager does not control the timing or amount of the cash flows.

Q.11) (i) TWRR = 20%

$$(1+i)^2 = \frac{500}{460} \times \frac{550}{500} \times \frac{600}{550} \times \frac{X}{600} \qquad (i = 20\%)$$

$$X = 662.4$$

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

$$i = 21.17\%$$

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

$$= (1.19565217 4)(1.204363636)$$

$$i = 20\%$$

LIRR = 20%

(iv) If the fund performance is reasonable stable in the period of assessment, then TWRR and MWRR will give similar results.

(v) TWRR is a better measure of investment as MWRR is sensitive to amount and timing of cashflows whereas TWRR eleminates this effect.

Q.12)

(i) The DPP tells us how long it takes for the project to move into position of profit. In many pratical problems, the net cashflow changes sign only once, this change being from (-)ve to (+)ve at a unique time t_1 or it will always be negative, in which case the project is not viable. t_1 is referred to as the DPP. It is the smallest value of t such that $A(t) \geq 0$, where:

$$A(t) = \sum_{s \leq t} c_s (1+j_1)^{t-s} + \int_0^t \rho(s)(1+j_1)^{t-s} ds.$$

b (ii) $i = 7\%$. ~~#~~ let DPP $= t$. , $AV_t \geq 0$

$$-800k(1+i)^t - 50k(1+i)^{t-1} + 100k(\bar{s}_{\overline{t-2|}}) = 0$$

$$-80(1.07)^t - \frac{5(1.07)^t}{1.07} + 10\left(\frac{(1.07)^{t-2} - 1}{\ln(1.07)}\right) = 0$$

~~$(1.07)^t = 3.78$~~

$$(1.07)^t = 3.327196$$

$$t \geq 17.7 \text{ years.}$$

$$t \approx 18 \text{ years.}$$

b) $AV_{22} = -800k(1.07)^{18} - 50k(1.07)^{17} + 100k * \bar{s}_{\overline{10|}} * (1.06)^4 + 100k\, \bar{s}_{\overline{4|}} @ 6\%.$

$AV_{22} = 29,575.25438 + 450458.0032$

$AV_{22} = 480033.258.$

(iii) DPP.

$AV_t = 0$

$-800k(1+i)^t - 50k(1+i)^{t-1} + 100k * s_{\overline{t-2}|} = 0$

$-80(1.07)^t - \frac{50(1.07)^t}{1.07} + 10\left(\frac{(1.07)^{t-2} - 1}{0.07}\right) = 0$

$t \geq 18.76$

(DPP) $t = 19$ years

$AV_{22} = -800k(1.07)^{19} - 50k(1.07)^{18} + 100k\, s_{\overline{17}|} * (1.06)^3$
$+ 100k\, s_{\overline{3}|} @ 6\%$.

$AV_{22} = -28{,}93{,}222.028 - 168996.6138 + 30{,}84{,}021.73 \times (1.06)$
$+ 3{,}18{,}360$.

$AV_{22} = 3{,}44{,}327.827$.

Q.13) (i) Let annual repayment $= X$

$988000 = X\, a^{(12)}_{\overline{25}|} @ 7\% = X\left(\frac{1 - v^{25}}{i^{(12)}}\right)$

$X = 82{,}176.89243$.

monthly installment $= 6848.07437$.

(ii) LOAN O/S at 10/03/29.

$PV = 6848.07437\, a_{\overline{136}|} @ \frac{i^{12}}{12} = 648{,}577.7278$

$\left(\frac{i^{12}}{12}\right) = 0.005654167$.

(iii) LOAN O/S after 10-09-2026.

$$PV = 6848.07437\, a_{\overline{166}|} @ \frac{i^{12}}{12}$$

$$PV = 7,36,123.4937 \cdots (1)$$

LOAN O/s after 10-10-2026.

$$PV = 6848.07437\, a_{\overline{165}|} @ \frac{i^{12}}{12} = 733437.5845 \cdots (2)$$

capital repaid on 10th October, 2026 = 2685.909224.

(iv) loan O/s after 10th April 2033.

$$PV_{10/04/2033} = 6848.07437\, a_{\overline{67}|} @ \frac{i^{(12)}}{12}$$

$$= 4,69,560.5748.$$

DATE	LOAN AT START	INSTALLMENT	INTEREST	CAPITAL REPAID.	LOAN O/S.
10/04/33	469560.5748	6848.07437	2654.9734	4193.1004	462712.500
10/05/33	462712.5004	6848.07437	2616.25375	4231.82062	455864.4261
10/06/33	455864.4261	6848.07437	2577.533	4270.54077	449016.3517
10/07/33	449016.3517	6848.07437	2538.813438	4309.260932	442168.2773
10/08/33	442168.2273	6848.07437	2500.093282	4347.981088	435320.203
10/09/33	435320.203	6848.07437	2461.373126	4386.701244	428472.12
10/10/33	428472.1286	6848.07437	2422.6529	4425.4214.	421624.05
10/11/33	421624.0542	6848.07437	2383.932814	4464.1415	414775.9798
10/12/33	414775.9778	6848.07437	2345.212658	4502.8617	407927.9055
10/1/34	407927.9055	6848.07437	2306.49250	4541.58186	401079.8311
10/2/34	401079.8311	6848.07437	2267.7723	4580.3020	394231.7567
10/3/34	394231.7567	6848.07437	2229052189	4619.02218	387383.6824.