1) $20000 = 427.90\, a_{\overline{60|}} @ i^{12}/12$

$$46.73989 = \frac{1 - (1+i)^{-60}}{i}$$

$i = 10.79\%$

$\frac{i^{12}}{12} = 0.008583$

$= 0.8583\%$

ii) $20000(1.1079) = 5134.8\, s^{12}_{\overline{1|}} @ 1.8\%$

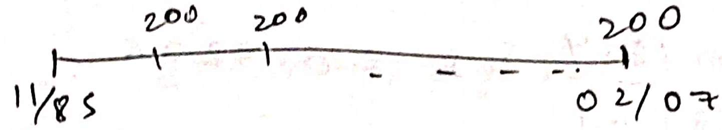
Capital left after 1 yr $= 5134.8\, a^{12}_{\overline{4|}} @ 10.8\%$

$= 16775.98$

$= 274.49\, a^{12}_{\overline{t|}} @ 10.8\% \times 12$

$t = 7.25$ yr Ans.

3)



$$\text{Annuity}_1 = 200v^{(1/4)}(\ddot{a}_{22} @ 8\%) = 2161.363$$

$$A_2 = 320(1+i)^{1/12}\left(a^{(4)}_{\overline{16}|} @ 8\%\right)$$

$$= 2957.872$$

$$A_3 = 180\left(a^{(12)}_{\overline{18.75}|} @ 8\%\right) = 1780.665$$

$$\text{Total} = 6899.90$$

$$6899.90 = A(1+i)^{1/4}\left(a^{(2)}_{\overline{21.5}|}\right)$$

$$A = 656.56.$$

4) From first principles,

$$(I\ddot{a})_n = 1 + 2v + 3v^2 + 4v^3 + 5v^4 \ldots nv^{n+1}$$

Multiplying both sides 'v'

$$v(I\ddot{a})_n = v + 2v^2 + 3v^3 + 4v^4 \ldots v^{n-1}\; nv^n$$

$$= (1-v^n)\cancel{/}(1-v) - nv^n$$

$$d(I\ddot{a})_n = \ddot{a}_n - nv^n$$

$$(I\ddot{a})_n = \frac{\ddot{a}_n - nv^n}{d} \quad \text{proved.}$$

5) i) $TWRR = \frac{16.4}{12.4} - 1 = 0.3226$

$= 32.26\%$

$TWRR = \frac{15.5}{12.1} - 1 = 28.10\%$

ii) a) $1240(1+i) + 1310(1+i)^{3/4} +$
$1480(1+i)^{1/2} + 1580(1+i)^{1/4} = 4 \times 1640$

$i = 0.2932 = 29.32\%$

b) $400 \times \ddot{s}_{\overline{1}|}^{(4)} = 100(16.4)\left(\frac{1}{12.4} + \frac{1}{13.1} + \frac{1}{14.8} + \frac{1}{15.8}\right)$

$\Rightarrow \ddot{s}_{\overline{1}|}^{(4)} = 1.1801$

$i = 29.8\%$

iii) $1210(1+i) + 920(1+i)^{3/4} + 1030(1+i)^{1/2} +$
$1310(1+i)^{1/4} = 4 \times 1550$

$i = 67.5\%$

6) i) $160000 = \alpha\, a_{\overline{10}|} @ 8\%$

$\alpha = 23844.651$ p.a.

ii) Loan outstanding after 4th pay

$23844.65 (a_{\overline{6}|} @ 8\%) = 110231.44$

$\therefore \beta\, a_{\overline{6}|} = 110231.44$

$\beta = 25309.72$ p.a.

iii) Loan outstanding after 7^{th} pay =

$$25309.72 \, (a_{\overline{3}|} \,@\, 10\%) = 62942.74$$

$$\therefore \, X \, a_{\overline{3}|} \,@\, 9\% = 62942.74$$

$$X = 24869.77$$

$$\therefore \text{yield} \Rightarrow 160000 + 1465 \, (a_4) - 443.95 \, (a_7)$$

$$- 24865.72 \, (a_{10}) = 0$$

$$\therefore \, i = 8.4\%$$

8) i) $PV = 2.7 + 0.2 a_{\overline{3}|} @ i\%$. — (i)

$0.1v^3 + \bar{a}_{\overline{10}|}(0.25v + 0.2v^2 + 0.1v^3) @ i\%$ — (ii)

$\therefore$ (i = ii) $i = 9.28\%$.

ii) $0.1v^3 + 0.85\bar{a}_{\overline{10}|}v^3$ @ (i=10%)

$= (0.1v^3 + 0.85\bar{a}_{\overline{10}|}v^3 - 2.7 - 0.2a_{\overline{3}|})$

$\Rightarrow 4.19 - 3.19 = 1.0089$

as NPV is +ve, its good to invest. (Ans).

10) let loan amount be ₹ L

$L = 180000 \times a_{\overline{15}|} + 20000 \times (Ia)_{\overline{15}|}$ @ 12%.

$L = 12,25,962 + 20,000 \times \left(\frac{7.6282 - 2.74}{0.12}\right)$

Amount of loan from bank = ₹ 20,40,588

Total cost of house $= \frac{2040588}{0.8} = 25,50,735$

Loan schedule:-

Yr	Loan o/s	Loan Installment	Cap repaid
9	18,75,850.33	3,60,000	1,34,897.
10	17,40,952.37	3,80,000	1,71,085
11	15,69,866.63		

11) i) TWRR $= (1+i)^2 = \frac{500}{460}\left(\frac{530+50}{500+40}\right)\left(\frac{4}{550}\right)$

$= 1.44$

$X = 655.78$ Ans.

ii) MWRR $\Rightarrow 460(1+i)^2 + 40(1+i)^{7/18} - 50(1+i)$

$= 655.78$

MWRR $= 19.95\%$

iii) $460(1+i) + 40(1+i)^{3/4} = 600$

$i = 20.445\%$

$(1+i) = \frac{655.78}{550} = 1.1923$

$\therefore$ LIRR $= (1+i)^2$

$= 1.9923(1.2044)$

$= 19.83\%$

12) a) DPP $\Rightarrow -800(1+i)^t - 50(1+i)^{t-1} + 100(\bar{s}_{\overline{t-2}|} @ 7\%) = 0$

$t = 17.8$ yr.

b) AV $\Rightarrow 100(\bar{s}_{4.23} @ 6\%) = 480$

AV $= 480000$

iii) $i = 6\%$, $100\bar{s}_{\overline{1}|} = 102.97\%$

$\therefore$ DPP $= -800(1+i)^t - 50(1+i)^{t-1} + 102.97 \, s_{\overline{t-2}|} @ 7\% = 0$

$\therefore$ $t = 18$ yrs. Ans.