iii) The original loan had 4 years of payment remaing thus.

Total Interest $= 4 \times 12 \times 427.90 - 16775.68$

$= 3763.22$

New loan has a term of 7.25 years hence

Total Interest $= 7.25 \times 12 \times 274.49 - 16775.68$

$= 7104.65.$

They will have to pay (7104.65 - 3763.22) 3341.23 more interest under

Q2 i) a Discounted payback period - The discounted payback period is the smallest time t for which the present (or accumulated) value of the return up to time t exceeds the present (or accumulated) value of the cost up to time t.

b Payback period:- The payback period is the same as the discounted payback period, except the present value calculation is carried out using an interest rate of 0. In other words, it is the earliest time for which the monetary value of the return exceeds the ~~Net~~ monetary value of the costs.

ii) Unlike the NPV, neither the DPP nor the PP give an indication of how profitable a project is, as they ignore cash flows after the accumulated value zero is reached.

There may not be one unique time when the balance in the investor's account changes from negative to postive. However NPV can ~~also~~ always be calculated.

The PP can give misleading results, as it does not take into account the time value of money.

Hence NPV is a superior measure as compared to DPP or PP.

$1 \rightarrow -95$

$1.2 \rightarrow -29.51$

$1.3 \rightarrow 2.145$

$1.29 \rightarrow 0.991$

$1.3 \rightarrow 2.145$

$1.293 \rightarrow -0.0419$

$1.294 \rightarrow 0.2658$

$1.2931 \rightarrow -0.018$

$1.2932 \rightarrow 0.0126 \ldots$

$\therefore x \approx 1.2932$

$1+i \approx 1.2932$

$$\boxed{i \approx 29.32\%}$$

b) Assuming that the investor purchases INR 100 worth of units each quater

$$400 \times \ddot{s}_1^{(4)} = 100 \times 16.4\left(\frac{1}{12.4} + \frac{1}{13.1} + \frac{1}{14.8} + \frac{1}{15.9}\right)$$

$$\ddot{s}_1^{(4)} = \frac{100 \times 4.72051784}{400}$$

$$\ddot{s}_1^{(4)} = 1.1801$$

$$\ddot{a}\ \frac{(1+i)^{n}-1}{i^{(4)}} = 1.801$$

$$\frac{(1+i)^n - 1}{i^{(4)}}\ \frac{1+i-1}{i^{4}} = 1.801$$

$$i/i^{(4)} = 1.801$$

$i^{(4)} = 4$

$$\left(1+\frac{i^{(4)}}{4}\right) = (1+i)$$

$$1+\frac{i^{(4)}}{4} = (1+i)^{1/4}$$

$$i^{(4)} = 4[(1+i)^{1/4}-1]$$

4) $(I\ddot{a})_n$ for $i>0$

1 2 3 4 ... n
0 1 2 3 ... n-1 n

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

$(I\ddot{a})_{\overline{n}|} = (1+i)(Ia)_{\overline{n}|}$

$= (1+i)\dfrac{\ddot{a}_{\overline{n}|} - nv^n}{i}$

$= \dfrac{\dfrac{\ddot{a}_{\overline{n}|} - nv^n}{i}}{1+i}$

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

OR

Multiplying both sides by v

$v(I\ddot{a})_{\overline{n}|} = v + 2v^2 + 3v^3 + 4v^4 \ldots nv^n$ —②

Subtracting

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

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

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

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

5) Time-weighted rate of return for each fund for the year 2014

$\dfrac{16.4}{12.4} - 1 = 0.3226$ or 32.26

$\dfrac{15.5}{12.1} - 1 = 0.2810$ or 28.10%.

ii)

a) Assuming that the investor bough 100 units per quarter in property fund a the equation of value is given by

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

Let $1+i = x$.

$1240(1+i) + 1310(1+i)^{3/4} + 1480(1+i)^{1/2} + 1580(1+i)^{1/4} - 6560 = 0$

$124x + 131x^{3/4} + 148x^{1/2} + 158x^{1/4} - 656 = 0.$

$0.3 \to -32.9$

$0.4 \to 125.1457076$

$0.32 \to -0.2907$

$0.33 \to 15.0009$

$0.321 \to 0.6862$

$0.322 \to 2.2797$

$0.3211 \to 0.8456.$

$0.32101 \to 0.7022$

- Rate of interest available in years 4 to 6 (i.e. after Project A has finished) will affect the comparison between the accumulated profits at the end of year 6.
- The risk associated with the receipt of income. If Project ... greater uncertainty or risk. It may not be accepted even though it has a higher IRR.

3) Value of 1st November 1995 is

Annuity 1 = $200 \times v^{(1/4)} \times \ddot{a}_{\overline{22}|}$ at 8%

$v^{1/4} = 0.980944$

$= 200 \times v^{1/4} \times a_{\overline{22}|} \times \frac{i}{d}$

$a_{\overline{22}|} = \cancel{10.6748}$ 10.2007

$d = 0.074074$.

$= 200 \times 0.980944 \times \cancel{10.6748}\ 10.2007 \times \frac{0.08}{0.074074}$

$= 2161.366301$

Annuit 2 = $320 (1+i)^{1/12} \times a^{(4)}_{\overline{16.25}|}$ at 8%

$(1+i)^{1/12} = 1.006434$

$= 320 \times 1.006434 \times \frac{1 - (0.925926)^{16.25}}{0.077706}$

$v = 0.925926$

$i^{(4)} = 0.077706$

$= 320 \times 1.006434 \times 9.184257$

$= 2957.870081$.

Annuity 3 = $180 \times a^{(12)}_{\overline{18.75}|}$

$i^{(12)} = 0.077208$.

$= 180 \times \frac{1 - (0.925926)^{18.75}}{0.077208}$

$v = 0.925926$

$= 180 \times 9.892578702$

$= 1780.664166$.

let the revised annity be A

Value of revised annuity is $X (1+i)^{1/4} \times a^{(2)}_{\overline{21.05}|}$

$(1+i)^{1/4} = 1.0194...$

$i^{(2)} = 0.0...461$

$A = \frac{6889.90}{1.019427 \times 10.30886}$

$= 656.56$

Assignment 2.

(ii) $APR \approx \dfrac{\text{average annual interest}}{\text{average loan amount}} = \dfrac{\text{average annual interest}}{\frac{1}{2} \times \text{original loan}} = \dfrac{2 \times \text{average annual interest}}{\text{original loan}}$ or $2 \times$ flat rate.

$\therefore$ original loan amount = Rs 20,000

$$20000 = 12 \times 427.90\, a_{\overline{5}|}^{(12)} \Rightarrow a_{\overline{5}|}^{(12)} = 3.8499.$$

$$\text{Flat rate} = \frac{\text{total interest}}{\text{loan} \times \text{total years}} = \frac{(5 \times 12 \times 427.90 - 20000)}{20000 \times 5} = 5.67\%$$

$APR \approx 2 \times 5.67 \approx 11\%$

$i = 11\%,\ a_{\overline{5}|}^{(12)} = 3.87872.$

$i = 10\%.\ a_{\overline{5}|}^{(12)} = 3.96154$

Interpolating APR, I is $\dfrac{i - 10\%}{3.8499 - 3.96154} = \dfrac{11\% - 10\%}{3.87872 - 3.96514}$

$i = 10.8\%$

At 10.8%, $12 \times 427.90\, a_{\overline{5}|}^{(12)} = 20000.2$

At 10.9%, $12 \times 427.90\, a_{\overline{5}|}^{(12)} = 19958.2$

$i = 10.8\%$ is more close. Hence APR is 10.8%

(iii) $APR = 10.8\%$

After 1 year capital left to pay $= 12 \times a_{\overline{4}|@10.8}^{(12)} \times 427.90 = 16775.9$

Let t denote the term of new loan then

$$16775.98 = 12 \times 274.49\, a_{\overline{t}|}^{(12)}$$

$$16775.98 = 3293.88\ \frac{(1 - 1.108^{-t})}{12 \times (1.108^{1/12} - 1)}$$

$1.108^{-t} = 0.4754$

$t = 7.25$ years.

Interal rate of return

i) The IRR for Project A is the rate of interest that satisfies the equation of value

$170000 \cdot 20000v = 10{,}000v^2 + 20000v + 20000v^2 + 200000v^3 = 0$

$10v^2 + 200v^3 = 170.$

$10v^2 + 200v^3 - 170 = 0.$

$0.9 \rightarrow -16.1$

$1 \rightarrow 40$

$0.93 \rightarrow -0.479$

$0.94 \rightarrow 4.9538.$

$0.9309 \rightarrow 0.0046$

$\therefore v = 0.9309$

$\frac{1}{1+i} = 0.9309$

$i = 0.07422924052$

$i = 7.422292\%.$

So IRR for Project B is exactly 7%.

$14a_{\overline{6}|} + 200v^6 = 200$

ii) Net Present Value.

The net present value are found by discounting the payments at 6%.

Project A : $NPV = -170\,000 + 10000v^2 + 200000v^3 = 6823.82.$

Project B $NPV = -200000 + 14000a_{\overline{6}|} + 200000v^6 = 9834.645$

Maximum Interest Rate beyond which projects are unprofitable

Each project will be profitable if the rate of interest at which funds can be borrowed is less than the internal rate of return so to be profitable. Project A requires a borrowing rate less than 7.422292% and Project B is requires a rate lower than 7%..

Other factors to be considered include:

- Project A does not provide any net income during the first year

The lower internal rate of return for Project B applies for a longer period