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Financial Mathematics

Q2 a] **Discounted payback period :**

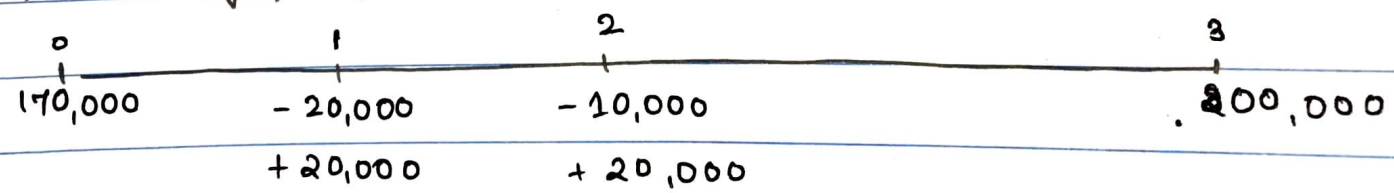
Discounted payback period is capital budgeting procedure used to determine profitability of the project. A discounted payback period gives the number of years it takes to break even from undertaking initial expenditure by discounting cash flow and recognizing the value of money

b] **Payback period :**

Payback period is the time you need to recover the cost of your investment

ii] a] whichever has high NPV because NPV is the best single measure of profitability NPV ignores any benifit that occur after the payback period.

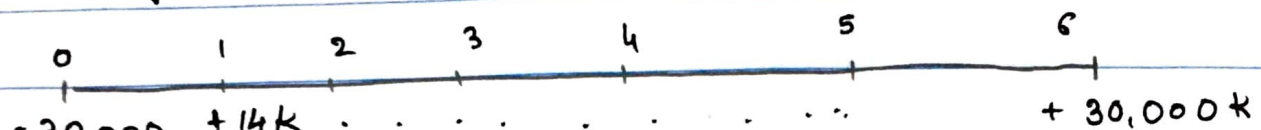
iii] a] a) IRR of project A



$i := -170,000 - 20,000v - 10,000v^2 + 200,000v^3$

$i := -170,000 - 20,000v + 20,000v^2 - 10,000v^3 + 20,000v^4 + 200,000v^6 = 0$

IRR of PROJECT B



$$NPV\ i := -30{,}000 + 14000\,v^6 + 30{,}000\,v^7$$

$$i := -30{,}000 + 14000\,v^6 + 30{,}000\,v^7 = 0$$

b] NPV of Project A

$$-170{,}000 + 40{,}000\ a\overline{3}|\ @\ i = 0$$

$$= 170000 + 40{,}000 \left[\frac{1-(1+i)}{6[1+i]}\right]^{-1} \left[\frac{1-(1+i)^{-3}}{i}\right] = 0$$

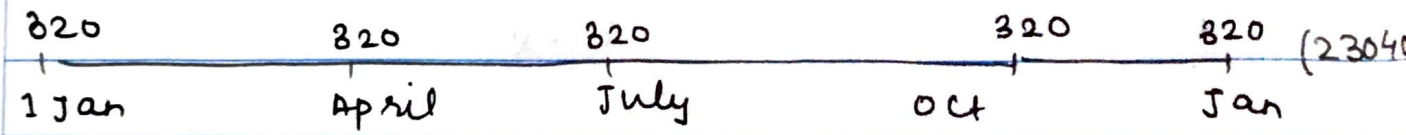
NPV of Project B

$$-30{,}000 + 14000\ a\overline{6}|\ @\ i = 0$$

$$30{,}000 + 14000 \left[\frac{1-(1+i)^{-6}}{i}\right] = 0$$

Q3 Annuity 1

Annuity 2



Annuity 3

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Revised annuity

$35420\ a^{(2)}_{\overline{23}|}\ @\ 8\%$

$= 35420 \left[\frac{1 - v^{23}}{d^2}\right]$

$= 35420 \left[\frac{1 - 0.9259^{23}}{0.0768}\right]$

$35420 \left[\frac{1 - 0.170200}{0.0768}\right]$

$35420\ (10.8046)$

PV $= 382698.93$

Q4 $(Ia)_{\overline{n}|} = v + 2v^2 + 3v^3 + 4v^4 \ldots (n-1)v^{n-1} + nv^n$

multiplying both sides by $(1+i)$

$(1+i) \times (Ia)_{\overline{n}|} = 1 + 2v + 3v^2 + 4v^3 + \ldots nv^{n-1}$

$i(Ia)_{\overline{n}|} = 1 + v + v^2 + v^3 + \ldots v^{n-1} - nv^n$

$= a_{\overline{n}|} + nv^n$

$i(Ia)_{\overline{n}|} = a_{\overline{n}|} - nv^n$

$(Ia)_{\overline{n}|} = \frac{a_{\overline{n}|} - nv^n}{d}$

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Q5] MWRI of property fund

$= 12.4(1+i)^4 + 13.1(1+i)^4 + 14.8(1+i)^4 + 15.8(1+i)^4 = 0$

MWRI of Equity fund

$= 12.1(1+i)^4 + 9.2(1+i)^4 + 10.3(1+i)^4 + 13.1(1+i)^4$

$= 0$

Q6] $x \cdot a\overline{10}| @ 8\% = 160{,}000$

$x \cdot 6.7101 = 1{,}60{,}000$

$x = \frac{1{,}60{,}000}{6.7101}$

$x = 23844.65$

2] $23844.6 \; a\overline{10}| @ 8\% \times v^6 + 23844.6 \; a\overline{6}| @ 1$

$23844.6 \quad 6.7101 \times 0.63030 + 23844.6 \quad 4.3553$

$= 159999.6 \times 103853.13$

$= 1.66164$

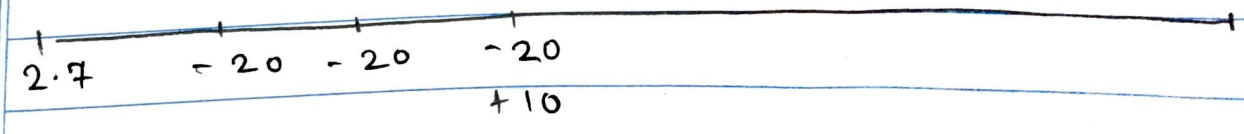
8] 23844.6 a $\overline{10}$ @ 8 d. $\times v^6$ + 2344.6 a $\overline{6}$ @ 10 d.
$\times v^7$ a $\overline{3}$ @ 9 d.

Q7 1] A tender is an offer to do work or supply goods at a fixed price when the goverment puts out the tender this means that it asks the public for price offers to do work or supply goods once the goverment accepts the tender it is binding to the both goverment & winning tender.

2] There are several advantages to the ~~usp~~ Govt in using bonds as a financial instrument the Govt does not give the ownership it attracts more investors increases flexibility and lower rate of return.

3] 1) shares
2) Treasuery bonds
3) Recurring Deposits

Q8



200×50 200×50 200×50

~~$-20 + 1000\, a_{\overline{10}|}$~~

1] $x \cdot a_{\overline{10}|} = 200$

$x \cdot a_{\overline{10}|} = 200$

$x = \dfrac{200}{a_{\overline{10}|}}$

2] NPV :

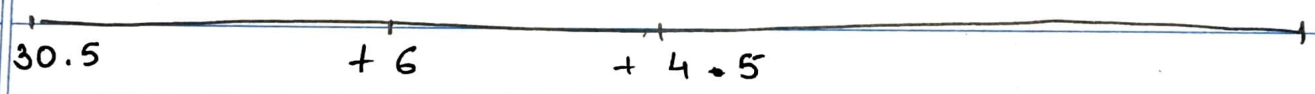
$-2.7 - 20v - 20v^2 + 50v^3 + 50v^4$

$-2.7 - 20v - 20v^2 + 50v^3 + 50v^4 = 0$

The project is profitable

Q9

1]



MWRR :

$30.5\,(1+i)^9 + 6\,(1+i)^8 + 4.5(1+i)^7 \not= 47$

$30.5\,(1+i)^9 + 6(1+i)^8 + 4.5(1+i)^7 \cdot 47 = 0$

TWRR

$(1+i)^9 + \dfrac{6}{33} * \dfrac{4.5}{33+6} \times \dfrac{4.7}{33+6} = 0$

iii) TWRR is better than MWRR because it ~~takes~~ also considers time while calculating Rate of Return.

Q10 i) $(I/A)\ \overline{n}\ @\ 12\%$

$180{,}000\ a\ \overline{5}\ +\ 20{,}000\ a\ \overline{5}$

$180{,}000 \times 6.8109 + 20{,}000 \times 6.8109$

$1225962.0 + 136218.0$

$= 1362180$

Q13 i) $x \cdot a\ \overline{25}\ @\ 4\% = 988000$

$x \cdot 11.6536 = 988000$

$x = \dfrac{988000}{11.6536}$

$x = 8480.66$