79,43,120.424 + 15,88,624.085 − 7,50,000

Assignment – Economics

Chapter-3

Equivalent worth Method.

Q. NO. 1 ⇒

Investment life = 3 year
MARR = 10%
present worth and future worth of Each project.

Project's Cash flow (Rs).

N	A	B	C	D
0	−1000	−1000	−1000	−1000
1	0	600	1200	900
2	0	800	800	900
3	8000	1600	1500	1800

Soln:
for Project (A).

Present worth (P_w) = ~~−1000 + 0 + 0 + 8000 x~~

$= P_0 + P_1 + P_2 + P_3$

$= P_0 + P_1 + P_2 + A(P/A, 10\%, 3)$

$= -1000 + 8000 \times \frac{[(1+0.1)^3 - 1]}{0.1 \times (1.1)^3}$

$= -1000 +$

GOOD MORNING PAGE NO.: DATE: / /

Present worth $(Pw) = P_0 + P_1 + P_2 + P_3$

$= P_0 + F(P/F, 10\%, 1) + F(P/F, 10 ...$

$+ F_3 (P/F, 10\%, 1)$

$= -1000 + 3000 \times [1+0.1]^{-3}$

$= -1000 + 2253.94$

$= 1253.94.$

future worth $(Fw) = F_0 + F_1 + F_2 + F_3.$

$= -1000 \times [F/P, 10\%, 3) + 3000$

$= \cancel{-1000 \times [1.1^3 - 1] + 3000}$

$= -1000 \times [1.1]^3 + 3000$

$= -1331 + 3000$

$=$ Rs $1669.$

for Project B.

Present worth $(Pw) = P_0 + P_1 + P_2 + P_3$

functionally

$P = F(P/F, 10, N).$

$Pw = -1000 + \frac{600}{(1.1)^1} + \frac{800}{(1.1)^2} + \frac{1500}{(1.1)^3}.$

$= 1333.58.$

Scanned with CamScanner

Future worth $(F_W) = F_0 + F_1 + F_2 + F_3$.

functionally,

$F = P(F/P, 10\%, N)$

Thus

$F_W = -1000 \times [1.1]^3 + 600 \times [1.1]^2 + 800 \times [1.1]^1 + 1500$

$=$ Rs 1775.

For Project C.

Present worth $(P_W) = P_0 + P_1 + P_2 + P_3$.

functionally,

$P = F(P/F, 10\%, N)$.

Thus

$$P_W = -1000 + \frac{1200}{1.1^1} + \frac{800}{1.1^2} + \frac{1500}{1.1^3}$$

$=$ Rs 1879.038.

And,

Future worth $(F_W) = F_0 + F_1 + F_2 + F_3$.

functionally,

$F = P(F/P, 10\%, N)$.

$F_W = 1500 + 800[1.1]^1 + 1200[1.1]^2 - 100 \times [1.$

$=$ Rs 2501.

GOOD MORNING PAGE NO.: DATE: / /

For Project D,

Present worth (Pw) = $P_0 + P_1 + P_2 + P_3$.

functionally,

$$P = F(P/F, 10\%, N).$$

Thus,

$$P_w = -1000 + \frac{900}{1.1} + \frac{900}{1.1^2} + \frac{1800}{1.1^3}$$

$$= 1914.35.$$

Again,

future worth (Fw) = $F_0 + F_1 + F_2 + F_3$.

functionally.

$$F = P(P/F, 10\%, N)$$

Thus,

$$F_w = -1000 \times [1.1]^3 + 900 \times [1.1]^2 + 900 \times [1.1] + 1800$$

$$= 2548.$$

Note!

In Every questions future worth can be directly calculated if we have present worth. i.e.

$$F_w(A) = P_w(A) \times [1+0.1]^3 = 1253.94 \times 1.1^3 = 1668.994$$

$$F_w(B) = P_w(B) \times [1+0.1]^3 = 1333.58 \times 1.1^3 = 1775$$

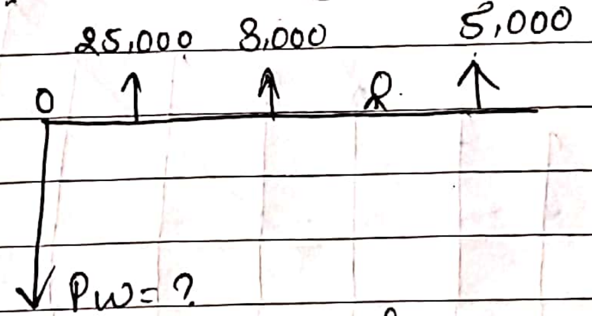
$$F_w(C) = P_w(C) \times [1+0.1]^3 = 1879.038 \times 1.1^3 = 2501$$

$$F_w(D) = P_w(D) \times [1+0.1]^3 = 1914.35 \times 1.1^3 = 2548.$$

Q. NO. 2 ⇒
Intrest Rate (I) = 10%.
Time Period (N) = 4 years
Money withdraw.

Year 1 : RS 25,000
Year 2 : RS 3,000
Year 3 : 0.
Year 4 : RS 5000.

Cash flow diagram,



functionally : $P = F(P/F, 10\%, N)$.

we know.
Present worth $(P_w) = P_1 + P_2 + P_3 + P_4$.

$$= \frac{25000}{[1+0.1]^1} + \frac{8,000}{[1+0.1]^2} + 0 + \frac{5,000}{[1+0.1]^4}$$

= RS 28621.678.

∴ RS 28621.678 should be deposited Now.

Q. NO. 3 =)

Given

Initial invostment (I) = 30,00,000.

Savings = Rs 12,00,000

operation and Maintainance Cost = Rs 2,50,000.

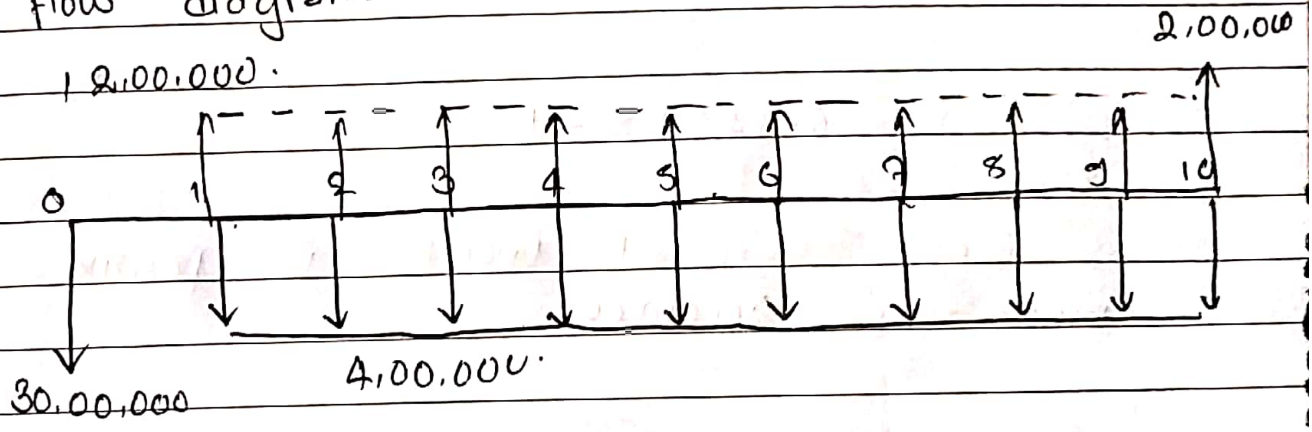
useful life (N) = 10 years.

Annual Taxes, increment = Rs 1,50,000.

Salvage value (S) = 2,00,000.

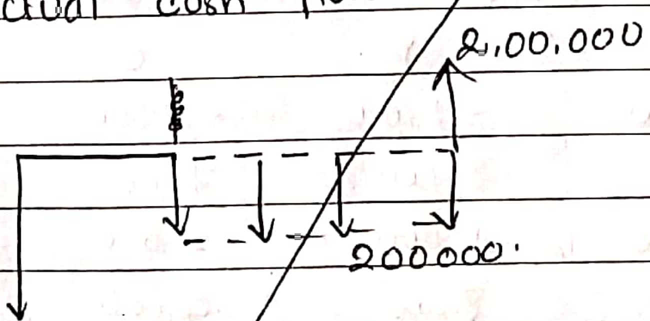
MARR = 18%.

Cash flow diagram



Now.

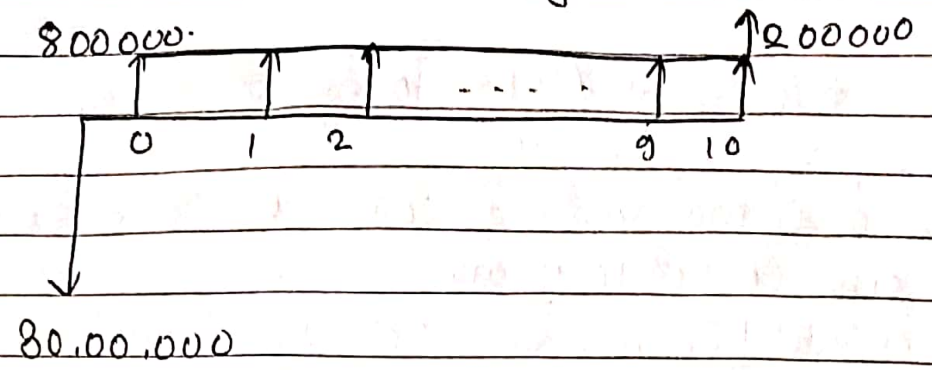
Actual cash flow is



$$\text{Present worth } (PW) = -30,0000 - \frac{200000 \times [1.18^{10} - 1]}{0.18 \times 1.18^{10}} + \frac{200000}{1.18^{10}}$$

=

Actual Cash flow diagram



Now, Present worth at 18% is,

$$= -3000000 + \frac{8000000\,(1.18^{10}-1)}{1.18^{10} \times 0.18} + 200000 / (1.18)^{10}$$

= Rs 633481.929

∴ Since Present worth is positive, the investment is accepted.

Q. No. 4 ⇒

Project cash flow.

N	A	B	C	D.
0	- 2,500	- 1,000	- 2500	- 3000.
1	5400	3,000	7,000	1,500
2	14,400	1,000	2,000	5,500
3	7,200	3,000	4,000	6,500

$\boxed{MARR = 10\%.}$

Solution:-

For Project A.

Future worth $(Fw(10\%)) = f_0 + f_1 + f_2 + f_3$

functionally,

$Fw = P(F/P, 10\%, N)$.

Thus.

$Fw(10\%) = 7200 + 14{,}400 \times [1.1]^1 + 5400 \times [1.1]^2 - 2500 \times [1.1]^3$

$= 26246.5$.

For Project B.

Future worth $(Fw(10\%)) = f_0 + f_1 + f_2 + f_3$

functionally,

$Fw = P(F/P, 10\%, N)$

Thus,

$fw(10\%) = f_0 + f_1 + f_2 + f_3$

$= 8000 + 1000 \times [1.1] + 3000 \times [1.1]^2 - 1000 \times 1.1^3$

$=$ Rs 6399.

For Project C.

future worth (Fw (10%)) = $F_0 + F_1 + F_2 + F_3$

functionally,

$Fw = P(F/P, 10\%, N)$.

Thus,

$Fw(10\%) = 4000 + 2000 \times [1.1] + 7000 \times [1.1]^2 - 2500 \times [1.1]^3$

$= Rs\ 11342.5$

For Project D.

Future worth (Fw(10%)) = $F_0 + F_1 + F_2 + F_3$.

functionally,

$Fw = P(F/P, 10\%, N)$

Thus.

$Fw(10\%) = 6500 + 5500 \times [1.1] + 1500 \times 1.1^2 - 3{,}300 \times 1.1^3$

$= 10870$.

Since, future worth of the Project A is highest it should be selected.

Q.NO.5 ⇒.

Initial investment (I) = 55,000
Net cash flow (Y_1) = 5000.
Gradient Amount (A) = 2500 per year.
Useful life (N) = 10 years.
Salvage value (S) = 6,000.
Interest Rate (i) = 12%.

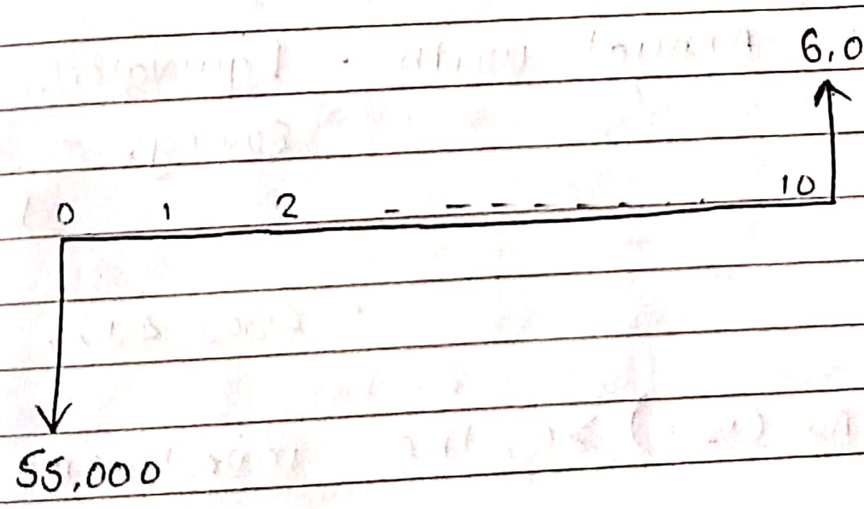
a) Determine the annual capital cost (ownership cost) for the equipment (~~9392.224~~).

b) Determine equivalent Annual Savings (revenue)

c) Determine if this is wise investment.

Soln!

Cash flow diagram



a) Annual capital recovery cost = $(55{,}000 - 6000)(A/P, 12\%, 10)$

$+ 6000 \times 0.12.$

$$= 49000 \times \left[\frac{0.12 \times (1.12)^{10}}{(1.12)^{10} - 1}\right] + 720$$

$$= 9392.224.$$

Equivalent Annual Savings

$= 5{,}000 + 2500\,(A/G,\ 12\%,\ 10)$

$= 5{,}000 + 2500 \left[\frac{(1.12)^{10} - 1.12 - 1}{0.12 \times [(1.12)^{10} - 1]} \right]$

$= 13961.63$ #

~~Net Present worth (NPW) = ?~~

~~Equivalen~~ To determine if the investment is safe or not.

Equivalent Annual worth = Equivalent Annual Savings − Capital Recovery

$= 4569.41$ //

$\therefore$ As $(AW(12\%)) > 0$, the investment is safe //

else,

a) Net present worth (NPW) = ?

PW of future cash flow = 5000 (P/A, 12%. 10) + 2500 (P/G, 12%. 10) + 6000 (P/F, 12%. 10

$$= 5000 \times \frac{(1.12)^{10} - 1}{0.12 \times (1.12)^{10}} + \frac{2500}{0.12^2} \frac{(1.12^{10} - 1.12 - 1)}{(1.12)^{10}} + 6000 \times (1.12)^{-10}$$

= 80818. 1767.

NPW = PW of future cash flow − Initial investment

= 80818. 1767 − 55000

= 25818. 1767

As, (NPW > 0). The investment is wise

Again,
second condition.
MARR = 10%

Q. NO. 6 ⇒.

Down payment = Rs 4000
Introst = 7%.

Remaining balance = Rs 40000 − Rs 4000
= Rs 36000

Now,
Calculating installments.

$A = P(A/P, 7\%, 5)$.

$= -36000 \dfrac{(0.7 \times 1.7^5)}{1.7^5 - 1}$

$=$ Rs -8780.065

Converting the down payment to annual form.

$A = P(A/P, 10\%, 5)$

$= -4000 \dfrac{(0.1 \times 1.1^5)}{1.1^5 - 1}$

$= -$Rs 1055.18.

Total worth AW = Rs $(-8780.065 - 1055.18)$
= Rs -9835.24

GOOD MORNING PAGE NO. : DATE : / /

$$= -\frac{500000 \times [(1.1)^{10} - 1]}{0.1} - \frac{50000 \times [1.1^{10} - 1]}{0.1}$$

$$- \frac{50000}{0.1} \times \frac{\{1.1^{10} - 1\}}{0.1} + \frac{10 \times 50000}{0.1}$$

$=$

for buying entire machine at once,

Investment = Rs 86000

so; converting to annual form.

$$AW = -36000\ (P/A,\ 10\%,\ 5)$$

$$= -36000\ \frac{(1.15 \times 0.1)}{(1.15 - 1)}$$

$$= Rs\ -9496.70$$

since, AW of buying the machine in cash > AW of buying in down payment.

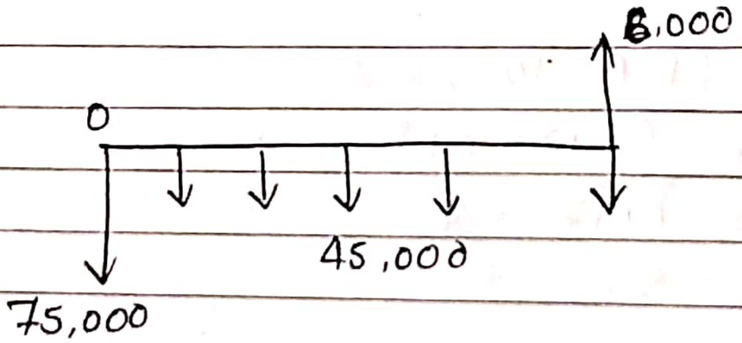
The machine must be bought in cash.

S. No. 7 =>

Cost of workstations = Rs 25000 each
Total cost of three engineering workstations
= 25000×3
= 75000

Useful life period (N) = 5 years.
Salvage value (S) = Rs 2000.
Operating and Maintainance cost = Rs 15,000 per each
= Rs 45000.

MARR = 15%.



Annual Expenses (E) = Rs 45,000
Capital Recovery Cost (CR)

$$= I\,(A/P, I\%, N) - S\,(A/F, I\%, N)$$

$$= 75{,}000 \times \left[\frac{0.15 \times (1.15)^5}{(1.15)^5 - 1}\right] - 6000 \times (0.1483).$$

$$= 22373.666 - 889.8933$$
$$= 21483.7720$$

Now.

Actual Cost = E + CR.

= Rs (45,000 + 21483.773)

= Rs 66483.773.

Hence, the equivalent annual costs for operating and engineering center = Rs 66483.773

Q. NO. 8 ⇒

Given,

Annual income (A) = Rs 5,00,000

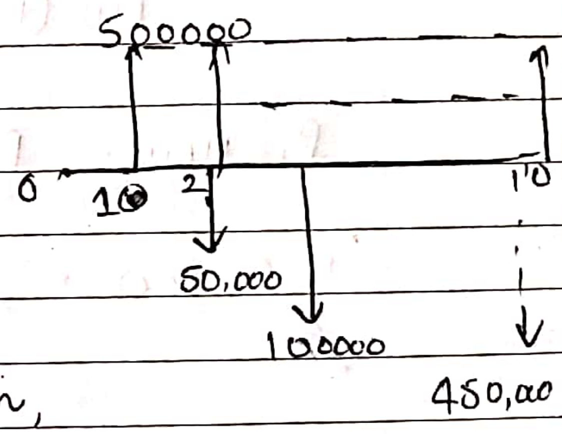
Decreasing value Rate = Rs 50000

Useful life (N) = 10 years.

Future worth (FW) = ?

MARR = 10 %.

Cash flow diagram



Using future worth formulation,

$fw(0\%) = F_A - F_G$

$fw(10\%) = +5,00,000\,(F/A, 10\%, 10)$

$\quad - G(F/G, 10\%, 10).$

$$fw(10\%) = 5,00,000\left[\frac{(1+0.1)^{10}-1}{0.1}\right] - \frac{50,000}{0.1}\left[\frac{1.1^{10}-1}{0.1}\right]$$

$$+ \frac{10 \times 50,000}{0.1}$$

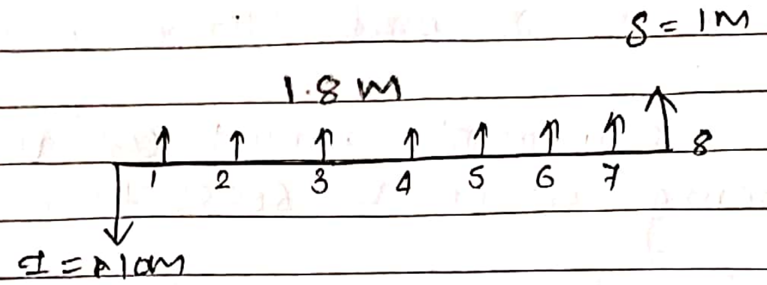
$= 50,00,000.$

∴ The equivalent fw using gradient series formula is Rs 50,00,000.

RATE OF RETURN METHOD

Q. No. 9 =>

Solution!



MARR = 10%. by calc (shift + calc)

0.1018.

Using PW method,

$$PW(i^*\%) = 0.$$

PinFlow − PWoutFlow = 0

$$1800000 \times \frac{(1+i^*)^8 - 1}{i^* \times (1+i^*)^8} + 1{,}000{,}000\,(1+i^*)^{-8}$$

$$- 10{,}000{,}000 = 0. \quad \text{--- (1).}$$

By hit and trial.

At $i^* = 10\%$. = $PW = 69374.536$.

At $i^* = 15\%$, $PW = -1595919.512$

∴ The i^* lies between 10% and 15%.

Using linear interpolation.

$$\frac{i^* - 10\%}{15\% - 10\%} = \frac{69374.536 - 0}{69374.536 - (-1595919.512)}$$

GOOD MORNING
PAGE NO.
DATE / /

$i^* = 10.208\%$

Using $i^* = 10.20890$ in eqn ①, $PW = -9907.272$

At $i^* = 10\%$, $PW = 69374.536$

$i^* = 10.20890\%$, $PW = -9907.272$

Using linear interpolation.

$$\frac{i^* - 10\%}{10.208 - 10\%} = \frac{0 - 69374.536}{-9907.272 - 69374.536}$$

$\Rightarrow i^* = 10.182\%$

Using $i^* = 10.182\%$, $PW = 50.299$

At $i^* = 10\%$, $PW = 69374.536$

$i^* = 10.182\%$, $PW = -50.299$

Using liner interpolation.

$$\frac{i^* - 10\%}{10.182\% - 10\%} = \frac{0 - 69814.536}{-50.299 - 69374.536}$$

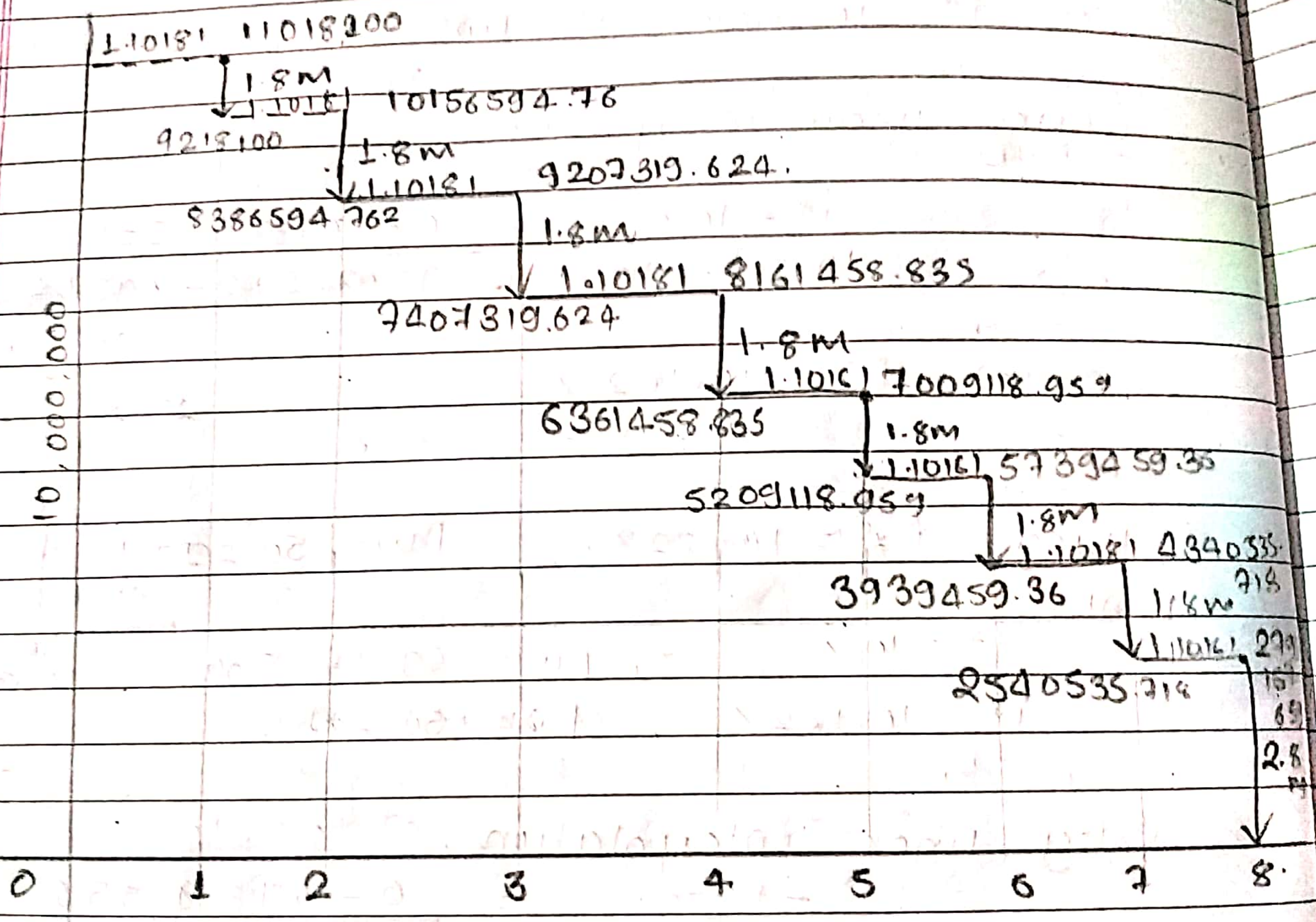
$\Rightarrow i^* = 10.181\%$

Using $i^* = 10.181\%$, $PW = 329.117$

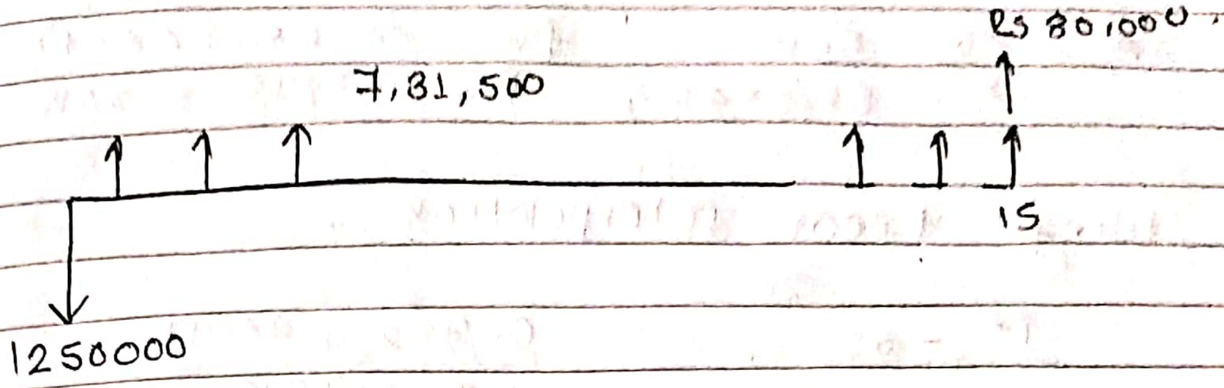
PAGE NO.:
DATE: / /

∴ $i^* = 10.181 > MARR (10\%)$, so the corporation should accept the project.

Now, unrecovered balance.



Q. No. 10 ⇒.



Given
MARR = 15%.
Using PW formulation,
$Pw(i^*\%) = 0$.
or Pw inflow − Pw outflow = 0.

$$\left[731500 \times \frac{(1+i^*)^{15}-1}{i^* \times (1+i^*)^{15}} + 80{,}000\,(1+i^*)^{-15}\right] - 12000 = 0.$$

By hit and trial method,

At $i^* = 55\%$, $Pw = 78254.44097$.
$i^* = 60\%$, $Pw = -31822.40292$.

Using linear interpolation.

$$\frac{i^* - 55\%}{60 - 55\%} = \frac{0 - 78254.44097}{-31821.40291 - 78254.44097}$$

$\Rightarrow i^* = 0.585545692$

GOOD MORNING
PAGE NO. :
DATE : / /

Using $i^* = 58.5545$ in eqn ① $PW = -1900.8984$.

At, $i^* = 55\%$, $PW = 78254.44097$
$i^* = 58.5545\%$, $PW = -1898.567418$.

Using linear interpolation,

$$\frac{i^* - 55\%}{58.5545 - 55\%} = \frac{0 - 78254.44097}{-1698.567418 - 78254.44097}$$

$\Rightarrow i^* = 58.47\%$.

Using $i^* = 58.47\%$ in eqn ①, $PW = -104.288$.

At
$i^* = 55\%$, $PW = 78254.44097$.
$i^* = 58.47\%$, $PW = -104.268$.

Using linear interpolation,

$$\frac{i^* - 55\%}{58.47\% - 55\%} = \frac{0 - 78254.44097}{-104.288 - 78254.44097}$$

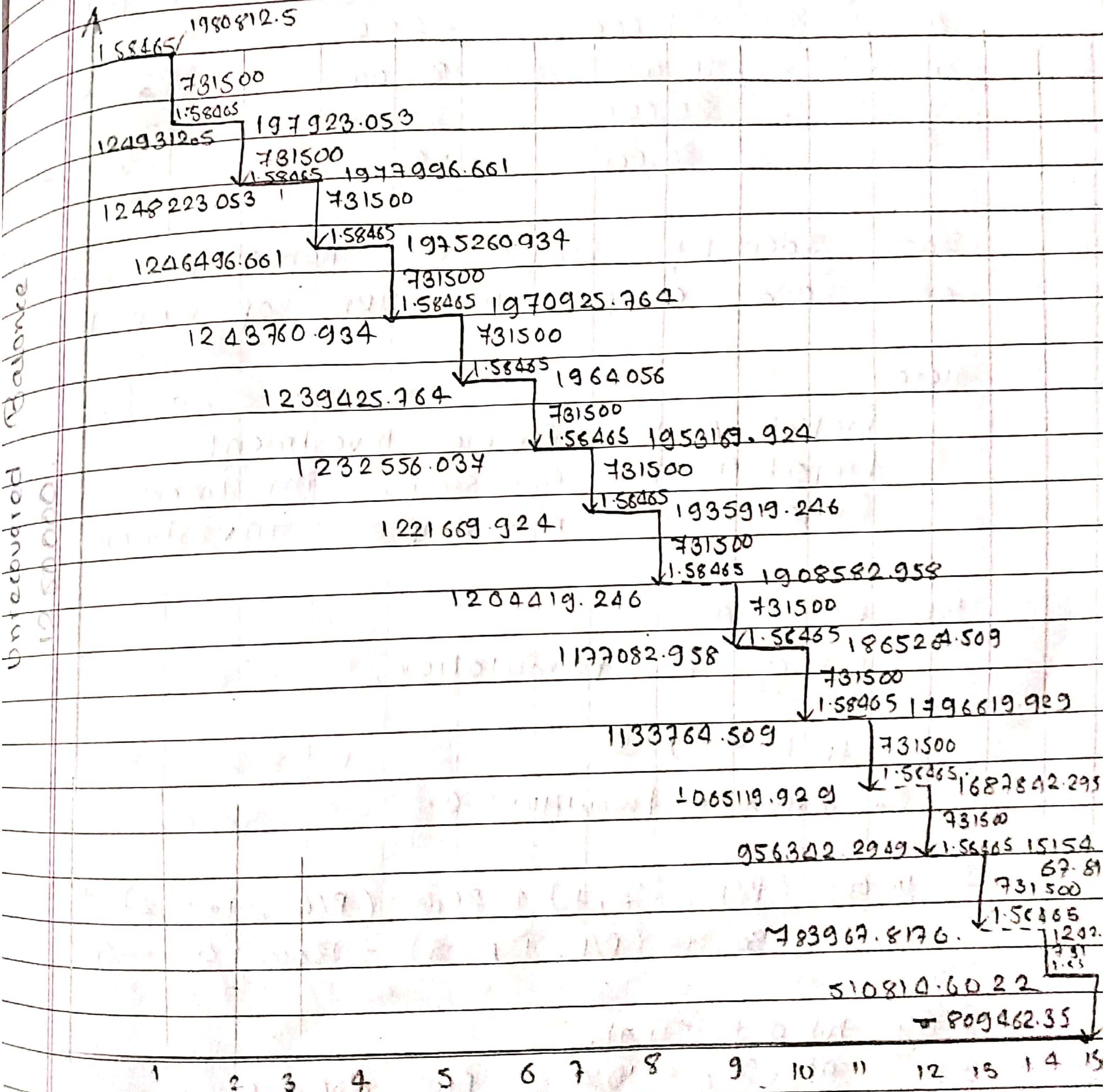
$\Rightarrow i^* = 58.465\%$.

Using $i^* = 58.465\%$ in eqn ①, $PW = 204$.

Scanned with CamScanner

GOOD MORNING
PAGE NO.
DATE: / /

Here IRR (58.465%) > MARR(18%).
Thus, the investment is Acceptable.



GOOD MORNING
PAGE NO.:
DATE: __/__/__

Q. No. 11 ⇒.

Year	Net cash flow (Rs)		
	Project A	Project B	Project C
0	−18,000	−20,000	−56,500
1	10,000	32,000	25,000
2	20,000	32,000	−64,59
3	30,000	−22,000	−78,845

~~End~~ Identify simple and non-simple investment and compute the IRR of each project.

here,

Project A is simple investment
Project B is non-simple investment
Project C is non-simple investment

for project A.

using Pw formulation,

$Pw(i^* \%) = 0.$

Pw inflow − Pw outflow = 0.

$10,000 (P/F, i^*_A, 1) + 20,000 (P/A, i^* \%, 2) +$
$30,000 (P/F, i^*_A, 3) - 18000 = 0 \quad \leftarrow (1).$

By hit and Trial,

At $I^*_A = 18\%$, $Pw = 250.868$

$i_A^* = 18\%$, $Pw = -157.484$

Scanned with CamScanner

GOOD MORNING
PAGE NO :
DATE : / /

using linear interpolation,

$$\frac{i_A^* - 73\%}{75\% - 73\%} = \frac{0 - 256.888}{-157.434 - 256.888}$$

$\Rightarrow i_A^* = 74.24\%$

using $i_A^* = 74.24\%$ in ①, $Pw = -1.847$

At $i_A^* = 73\%$, $Pw = 256.888$.
$i_A^* = 74.24\%$. $Pw = -1.847$

using linear interpolation,

$$\frac{i_A^* - 73\%}{74.24\% - 73\%} = \frac{0 - 256.888}{-1.847 - 256.888}$$

$\Rightarrow i_A^* = 74.231\%$.

using $i_A^* = 74.231\%$ in ①, $Pw = 0.00849\%$.

for Project B.
using Pw formulation,

$Pw(i^*_B\%) = 0$

Pw inflow - Pw outflow = 0.

$82{,}000\,(P/F, i^*_B, 1) + 32000\,(F/F, i^*_B, 2) -$
$22000\,(P/F, i_B^*, 3) - 20000 = 0$ — ②

By hit and Trial,

At $i_B^* = 110\%$, $PW = 118.777$.

$i_B^* = 113\%$, $PW = -199.886$

Using linear interpolation,

$$\frac{i_B^* - 110\%}{113\% - 110\%} = \frac{0 - 118.777}{-199.836 - 188.777}$$

$\Rightarrow i_B^* = 111.118\%$.

Using $i_B^* = 111.118\%$ in eq^n 2, $BW = -1.025$.

At, $i_B^* = 110\%$, $PW = 118.777$.

$i_B\% = 111.118\%$, $PW = -1.025$.

Using linear interpolation,

$$\frac{i_B^* - 110\%}{111.188\% - 110\%} = \frac{0\text{-}118.97}{-1.025 - 118.77}$$

$\Rightarrow i_B^* = 111.108\%$.

Using $i_B^* = 111.108\%$. in eq^n 2, $Pw = 0.09$.

Thus irr of Projec B is 111.108%.

for Project c,
using PW formulation,

$PW(i_c^*) = 0$.

$PW_{inflow} - PW_{outflow} = 0$.

$2500(P/F, i^*, 1) - 6450(P/F, i_c^*, 2) - 78345(P/F, i_c^*, 3) - 56500 = 0$ --- (3).

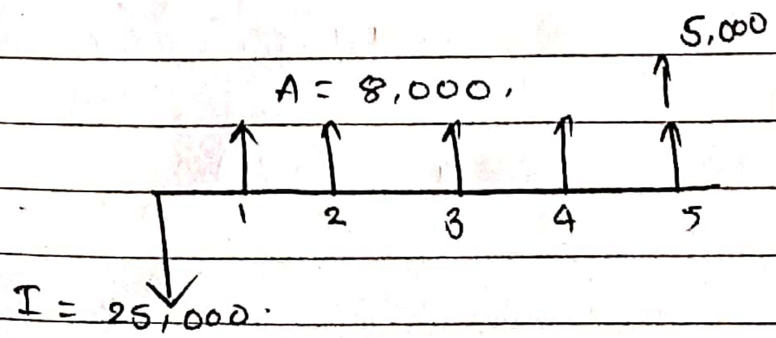
using calculator,
⇒ Not available.

ie calculation of IRR is Not feasible for such type of cashflow.

12]. Calculate the ERR for following Project if MRR = 15%.

(i)

EOY	Net cash flow.
0	−25,000
1	8,000
2	"
3	"
4	"
5.	13,000.



Soln:

Step1: Discount all cash outflow at point zero at 15% per compounding period.

So,

Net cash flow outflow = Rs 25,000 = P — (i)

Step2: Compounding all cash inflow to year 5 at 15%. 8,000 (F/A, 15%, 5) + 5000

$$= \frac{8000 \times [(1.15)^5 - 1]}{0.15} + 5{,}000$$

$$= \text{Rs } 58989.05 \quad \text{— (ii)}$$

Step3: Establishing the equivalance between two eq's

$25000(F/P, i, 5) = 58989.05$.

Or, $25{,}000(1 + i')^5 = 58989.05$

$\Rightarrow i' = 18.71\%$.

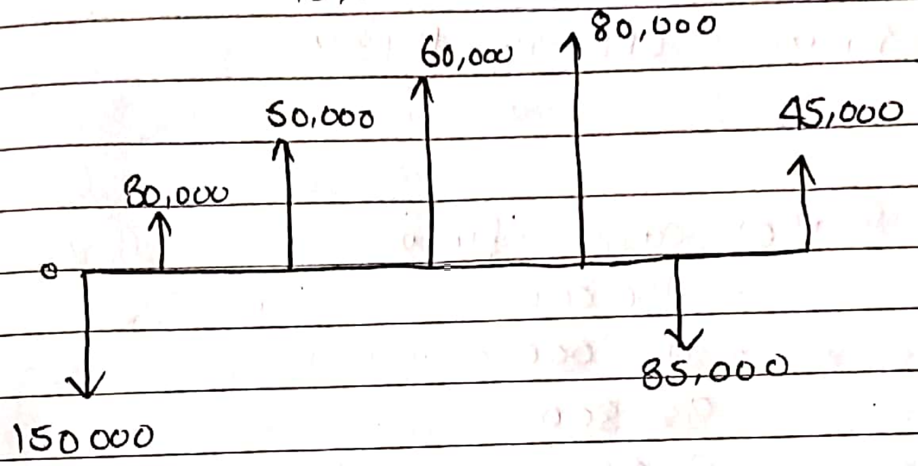
Since ERR (18.71%) > MARR (15%)

So, the project is accepted.

∴ The Required ERR is 18.71%.

b)

EOY	NET Cash Flow
0	− 1,50,000
1	80,000
2	50,000
3	60,000
4	~~−35,000~~ 80,000
5	− 85,000
6	45,000.



Step 1: Discount all the cash outflow to year 0 at 15%.

$150000 + 85000\,(P/F,\ 15\%,\ 5)$.

$= Rs\ 1,67,401.1857$

Step 2: Corresponding all the cash inflow to year 6 at 15%.,

$80,000\,(F/P,\ 15\%,5) + 50,000\,(F/P, 15\%,\ 4) + 60,000\,(F/P,\ 15\%.3)$
$+ 80,000\,(F/P,\ 15, 2) + 45,000$

$= Rs\ 389843.5281$

Step 8: Establishing the equivalence between two eqns.

$1,67,401.1857 \, (F/P, i\%, 6) = 3,89,843.5281$

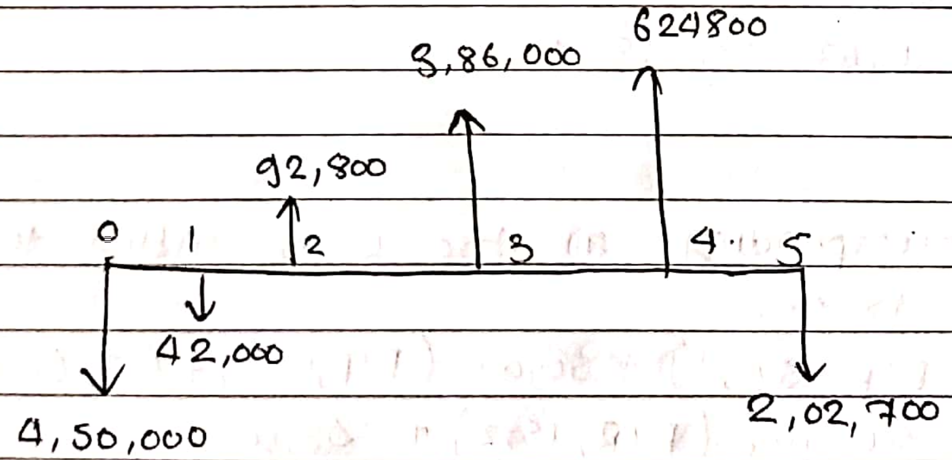
$1,67,401.1857 \, (1+i)^6 = 319843.5281$

$i' = 15.13\%$

Thus required ERR is 15.13%.

c)

EOY	Net cash flow
0	− 450 000
1	− 42,000
2	92,800
3	3,86,000
4	6,24,600
5	−2,02,700



GOOD MORNING
PAGE NO.:
DATE: / /

Sol^n:

Step 1: Discount all the cash outflow to year zero at 15%. ~~4,50,000 + 42~~

$4,50,000 + 42,000\,(P/F, 15\%, 1) + 2,02,200\,(P/F, 15\%, 5)$

$= Rs\ 5872934.634$

Step 2: Compounding all the cash ~~outflow~~ inflow to year 6 at 15%.

$92,800\,(F/P, 10\%, 3) + 3,86,000\,(F/P, 10\%, 2) + 624\,(F/P, 15\%, 1)$

$= 1358412.2$

Step 3: Establishing the equivalance between two eqn.

$582299.4634\,(F/P, i\%, 5) = 1358412.2$

or, $582299.4634\,(1+i')^5 = 1358412.2$

$i\% = 18.259\%$

Thus, Required ERR is 18.259% //

* Benefit Cost Analysis.

13 Find by using both types of B/C ratio using AW and FW method.

i) Investment = Rs 250000
ii) Annual Benefit = Rs 75,000
iii) Annual Cost = Rs 15,000
iv) Salvage Value = Rs 25,000
v) MARR = 12%.
vi) Number of Years = 10.

Using PW formulation,

Capital Recovery (CR) = 250000 (A/P, 12%, 10) − 25000 (A/F, 12%, 10)

$$= 250{,}000 \times \frac{0.12 \times (1.12)^{10}}{(1.12^{10} - 1)} - 25000 \times \frac{0.12}{(1.12^{10} - 1)}$$

$= 42821.4369$

So,

$$\text{Conventional B/C Ratio} = \frac{AW(B)}{CR + AW(O+M)}$$

$$= \frac{25{,}000}{42821.4369 + 15{,}000}$$

$= 1.29.$

Modified B/C Ratio = $\frac{AW(B) - AW(O\&M)}{CR}$

$= \frac{25000 - 15000}{42821.4369}$

$= 1.4$

• Using FW formulation.

$FW(B) = 75,000\ (F/A, 12\%, 10) = \frac{75,000 \times [(1.12)^{10} - 1]}{0.12}$

$= Rs\ 1316155.13$

$FW(O\&M) = 15000 \times (F/A, 12\%, 10).$

$= \frac{15000 \times (1.12^{10} - 1)}{0.12.}$

$= 263231.026$

Now,

Conventional B/C Ratio = $\frac{FW(B)}{FW(I) - S + FW(O\&M)}$

$= \frac{1316155.13}{776462.0521 - 25000 + 263231.82}$

$= 1.29$ Ans

Scanned with CamScanner

GOOD MORNING PAGE NO.: DATE: / /

Modified B/C Ratio = $\frac{FW(B) - FW(O\&M)}{FW(I) - S}$

$= \frac{1316155.13 - 263231.026}{336462.0521 - 25000}$

$= 1.4 \text{ } \#$

14. Soln:

Initial cost = 250,000

Annual revenue = 75,000 at the end of first ye[ar] and increasing by Rs 5,000 each year.

Annual O&M = 15,000

Salvage value = 25,000

MARR = 10%

let N = 10 years

$fw(I) = 250,000 \times (F/P, 10\%, 10)$

$= 250,000 \times (1.1)^{10}$

$= 648435.615.$

$fw(B) = (75000) \times \frac{(1.1)^{10} - 1}{0.1} + 5000 \times \left[\frac{(1.1)^{10} - 1}{0.1^2} - \frac{10 \times 50}{0.1}\right]$

$= 1492178.075$

Scanned with CamScanner

$$FW(O\&M) = 15000\ (F/A, 10\%, 10)$$

$$= 15000 \times \frac{(1.1)^{10} - 1}{0.1}$$

$$= 239061.369$$

Now,

$$\text{Conventional B/C ratio} = \frac{FW(B)}{FW(I) - S + FW(O\&M)}$$

$$= \frac{1492178.075}{648435.815 - 25000 + 239061.30}$$

$$= 1.73$$

$$\text{Modified B/C Ratio} = \frac{FW(B) - FW(O\&M)}{FW(I) - S}$$

$$= \frac{1492178.015 - 239061.369}{648435.615 - 25000}$$

$$= 2.01$$

Q.NO. 15 =>

~~Soln~~:

Initial cost = Rs 18,00,00,000

Annual Power Sales = Rs 1,20,00,000

Annual flood control saving = Rs 50,00,000

Annual irrigation benefit = Rs 80,00,000

Annual recreation benefit = Rs 40,00,000

Annual Operating & maintainance costs = Rs 50,00,000

life of the project = 40 years.

MARR = 15%

Soln:

Using AW formulation.

$$CR = 18{,}00{,}00{,}000\ (A/P, 15\%.\ 40) - 0$$

$$= 18{,}00{,}00{,}000 \times \frac{0.15 \times 1.15^{40}}{(1.15^{40} - 1)}$$

$$= \text{RS}\ 27101175.3$$

$$AW(B) = 1{,}20{,}00{,}000 + 50{,}00{,}000 + 80{,}00{,}000 + 40{,}00{,}000$$

$$= 290{,}00{,}000$$

$$AW(O\&M) = \text{RS}\ 50{,}00{,}000.$$

Now.

$$\text{Conventional B/C Ratio} = \frac{AW(B)}{CR + AW(O\&M)}$$

GOOD MORNING
PAGE NO. :
DATE : __/__/____

$$= \frac{2,90,000}{271\ 01175.3 + 50,00,000}$$

$= 0.903 < 1$ (rejected) //

Modified B/C Ratio $= \dfrac{AW(B) - AW(O\&M)}{CR}$

$$= \frac{290000 - 5000000}{271,01175.3}$$

$= 0.885 < 1$ (reject) //

Scanned with CamScanner

* Payback Period method.

Q. NO. 16 ⇒

Soln:

~~MARR = 20%~~.

Merits:

- Simple to use and easy to understand
- It is interpreted in tangible terms (in years
- It doesn't required any assumption in term of timing, life time & intrest rates.
- Quick solutions.
- Useful in case of uncertainity

Demerits.

- Not all cash flow are covered
- No concrete decision criteria that indicate whether the investment increases the value
- Not realistic and ignores profitability

Simple payback Period	Discounted Payback Pe
i) It doesn't consider time value of money (i=0)	i) It considers time value of money.
ii) It doesn't use discounted cash flow, thus is ~~ten~~ less accurate	ii) It uses discounted c flow, thus is more accurate.

T= 5 years (assumption)

Period	cash	fw at 20%.	Cumulative.
0	-25,000	-25,000	-25,000
1	8,000	6,667	-18,333
2	8,000	5556	-12,133
3	8,000	4630	-8,147
4	8,000	3858	-4289
5	18,000	5223	+934

here, the commulative cash flow turns positive in year 5, therefore, payback period lie between year 4 and 5. By interpolating, we get the payback period $= 4 + \frac{4289}{5,223} = 4.82$ years //

Q.NO. 17 //

Project	Involvement (Rs)	Annual cash flow	life in yrs
A	10,000	4,000	12
B	25.000	10,000	4
C	80, 000	6,000	20
D	85.000	12,000	16

which project would be the best one?

for

P.T.O

GOOD MORNING PAGE NO.: DATE: / /

For Project A.

Period	cash	PW at 10%.	Cumulative
0	-10,000	-10,000	-10,000
1	4,000	3636.36	-6363.64
2	"	3305.78	-3057.56
3	"	3005.259	-52.601
4	"	2732.054	2679.453
5	"	2483.685	5163.138

Here, commulative cash flow is negative on year 3 and positive on year 4. Hence, the payback period ~~is~~ lies between 3 and 4.

By interpolating,

$$3 + \frac{52.601}{2732.054} = \cancel{3.019}$$

$= 3.019$ years

For Project B.

n	flow	PW at 10%.	Commulative
0	-25,000	-25,000	-25,000
1	10,000	9090.90	-15,909.1
2	10,000	8264.46	-7644.64
3	10,000	7513.148	-121.492
4	10,000	6830.13	6698.638.

interpolating, $3 + \frac{121.492}{6830.13} = 3.0192$ years

GOOD MORNING
PAGE NO. :
DATE : __/__/____

For project c.

n.	Flow	PW at 10%.	Commulative
0	-30,000	-30,000	-30,000
1	6,000	5454.54	-24545.46
2	6,000	4958.67	-19586.79
3	6,000	4507.88	-15078.92
4	6,000	4098.08	-10980.83
5	6,000	3725.527	-2255.303
6	6,000	3386.84	-3868.463
7	6,000	3078.948	-789.525
8	6,000	2799.048	2009.529

Interpolating, $7 + \frac{789.515}{2799.099} = 7.28$ years #

Scanned with CamScanner

for Project D,

n	flow	Pw at 10%	Commulative
0	-35,000	-35,000	-35,000
1	12,000	10909.09	-24090.91
2	"	9917.35	-14173.56
3	"	9015.77	-5157.79
4	"	8196.162	3038.371

interpolating

$$3 + \frac{5157.79}{8196.162} = 3.629 \text{ years}$$

Since payback period of project A and Project B is less than other, I would recomment Project A and Project B as the best one.

Q.NO.18 ⇒

EOY	A	B	C	D
0	-1500	-4000	4500	3000
1	300	2000	2000	5000
2	"	1500	2000	3,000
3	"	1500	2000	2,000
4	"	500	~~2000~~ 5000	1,000
5	"	500	5000	1,000
6	"	1500		1,000
7	"			2,000
8	"			3,000

Q) Soln:

~~for~~ for Project A,

Payback Period = $\frac{1500}{300}$ = 5 years.

for Project B.

Period	Net cash flow (Rs)	Commulative cash flow
0	-4,000	-4,000
1	2000	-2,000
2	1500	-5,00
3	1500	1000
4	500	1500
5	500	2000
6	1500	3500

Change is in between two and 3 years.

interpolating ~~2o7~~ $2 + \frac{500}{1500}$

= 2.33 years #

for Project C.

n	Net cash flow	Commulative
0	- ~~2~~ 4500	-4500
1	2,000	-2500
2	11	-500
3	11	1500
4	5000	6500
5	11	11,500

There is sign change between 2^{nd} and 3^{rd} year.
So, interpolating,

$$2 + \frac{500}{2000} = 2.25 \text{ years.}$$

For Project D,

n	Net cash flow	Commulative
0	−3,000	−3,000
1	5,000	2000
2	3,000	5000
3	−2000	3,000
4	1000	4,000
5	1,000	5,000.

here. commulative cash flow Turn positive in year 1,
interpolating,

$$0 + \frac{3000}{5000} = 0.6 \text{ years.}$$

c) Assuming $i = 10\%$.
calculating discounted payback period.

For project A.

n	flow	PW at 10%	Commulative
0	1500	-1800	-1500
1	800	273	-1227
2	800	248	-979
3	"	226	-753
4	"	205	-548
5	"	187	-362
6	"	170	-192
7	"	150	-37
8	"	140	+108

Here commulative cash flow turns to positive in year 8.
So the payback period lies between 7 and 8.
By interpolating
Payback period $= 7 + \frac{37}{140}$
$= 7.289$

GOOD MORNING
PAGE NO.:
DATE: / /

for Project B

Period	Flow	Pw at 10%.	Commulative
0	−4000	−4000	4000
1	2000	1819	−2189
2	1500	1240	−942
3	1500	1127	+186
4	500	342	+528
5	500	311	+839
6	1500	847.	+1686.

Here commulative cash flow Turns positive in year 3, so payback period lies between 2 and 3, By interpolating,

$$\text{Payback Period} = 2 + \frac{941}{186+941}$$

$$= 2.835 \text{ years}$$

Project C.

n	flow	Pw at 10%.	Commulative
0	−4800	−4500	−4500
1	2000	1819	−2681
2	2000	1653	−1028
3	2000	1503	+425
4	5000	3415	+3090
5	5000	3105.	+6995.

Here, Commulative cash flow turns to +ve in year 3, so the payback period lies between year 2 & 3.

GOOD MORNING
PAGE NO.:
DATE: / /

By interpolating

$$\text{Payback Period} = 2 + \frac{1028}{425+1028}$$

$$= 2.634 \text{ years}$$

Project D.

n	Flow	PW at 10%	commulative
0	-8000	-3000	-8000
1	5000	4546	1548
2	8000	2479	4025.

For input D, it is Not meaningful to calculate payback period as commulative cash flow Turns positive in year 1 #.

b) =)

It is Not meaningful to calculate payback period of project D as. according to given cash flow, the payback period should lie between 0 & 1, but is it not possible for payback period to lie between 0 and 1, ~~but it is Not possi~~ as initial invesment can't be returned back without net Annual cash flow