A#1

Bisheshwor Neupane Roll no.-35

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$0 = NPV = \sum_{0} C$

Year	Project A	Project B
0	-1000	-1000
1	500	100
2	400	300
3	300	400
4	100	600

find the IRR when the cost of capital is 10%.

Project A

-1000	500	400	300	100
0	1	2	3	4

Project B

-1000	100	300	400	600
0	1	2	3	4

$$PV = \frac{F}{(1+i)^n}$$

Net Present value = PV(cash outflow)
= PV(cash inflow)

$NPV=0 = PV_0 + PV_1 + PV_2 + PV_3 + PV_4$

for (PA); or, $0 = -1000 + \frac{500}{(1+R)} + \frac{400}{(1+R)^2} + \frac{300}{(1+R)^3} + \frac{100}{(1+R)^4}$

for 14%,

~~or, 0 = −1000 + 500×50 + 400×[illegible] 2500~~
~~[illegible] 37 [illegible] 2549~~

~~or, 0 = −1000 + 438.596 + 392.3107 + 299.179~~
~~+ 99.9615~~

~~or, [illegible]~~

Suppose, $r = 15\%$, $NPV = -8.335$.

~~or, $-1000(1+R)(1+R^2)(1+R^3)(1+R^4)$~~

For 14%.

~~$-1000(1+R)(1+R)^2(1+R$~~

or, $NPV = -1000(1+R)^4 + 500(1+R)^3 + 400(1+R)^2 + 300(1+R) + 100$

or, $0 = -1000 \times 1.689 + 500 \times 1.4815 + 400 \times 1.2996 + 300 \times 1.14 + 100$

or, $0 = -1689 + 740.75 + 519.84 + 442$

$= 8.08 > 0$

For $r = 15\%$.

$NPV = -8.335$.

15%	14%
−8.335	8.08

$x \times 16.415 = 1 \times 8.335$

$x = \frac{1 \times 8.335}{16.415} = 0.507$

$IRR = 15 - 0.507 = 14.493$

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Proj B8

-1000	100	300	400	600
0	1	2	3	4

$$PV = \frac{F}{(1+r)^n}$$

Now, lets take $i = 12\%$.

$$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4$$

$$= -1000 + \frac{100}{(1+0.12)} + \frac{300}{(1+0.12)^2} + \frac{400}{(1+0.12)^3} + \frac{600}{(1+0.12)^4}$$

$$= -1000 + 89.286 + 239.158 + 284.712 + 381.31$$

$$= -5.53$$

since, NPV is negative, we ~~take~~ calculate NPV with lower rate,

so, lets take $i = 11\%$.

$$NPV = \cancel{PV_0 + P}\ -1000 + \frac{100}{1+0.12} + \frac{300}{(1.11)^2} + \frac{400}{(1.11)^3} + \frac{600}{(1.11)^4}$$

$$= -1000 + 90.09 + 243.487 + 292.477 + 395.239$$

$$= 21.293$$

Now,
$$IRR = L + \left[\frac{N_L}{N_L - N_H} \times (H-L)\right]$$

$$= 11\% + \left[\frac{21.293}{21.293 + 5.53} \times (12-11)\right]\%$$

$$= 11\% + 0.79$$

$$\therefore IRR = 11.79\%$$

Your local foundry is adding a new furnace. There are several different styles and types of furnaces, so the foundary must select from among a set of mutually exclusive alternatives. Initial capital investment and annual expenses for each alternative are given in the table below. None have any market value at the end of its useful life. Using a MARR of 15%, which furnace should be chosen?

~~Investment~~	F1	F2	F3
Investment	\$ 110,000	\$ 125,000	\$ 138,000
Useful life	10 years	10 years	10 years
Total annual expences	\$ 53,800	\$ 51,625	\$ 45,033

Present value in terms of annual expense,

$$(P/A, i\%, N) = \frac{1-(1+i)^{-N}}{i} \rightarrow (1)$$

For F_1,

$$P.W_{F_1} = -11000 - 53800(P/A, 15\%, 10)$$

$$= -110000 - 53800\left(\frac{1-(1.15)}{0.15}\right)$$

$$= -110000 - 53800 \times 5.019$$

$$= -\$380,009.752$$

Also, for F_2,

$$PWF_2 = -125000 - 51625(P/A, 15\%, 10)$$

$$= -\$384,093.93$$

~~PW~~ for F3

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$PW_{F3} = -138000 - 49033\,(P/A, 15\%, 10)$

$= -\$\,364020.627$

since F3 costs less than F1 and F2, so, it has large P.W and ~~be~~ economically best.

3. given ~~capital~~ MARR = 12%, life = 8 years

	A	B	C	D	E
capital Investment	\$12,000	\$ 12500	\$14,400	\$ 16250	\$ 20,000
Net annual income	\$ 2500	\$ 2520	\$ 3050	\$ 3620	\$ 4,400
IRR	12.99%	13.48%	14.99%	14.99%	14.61%

Soln,

As IRR > MARR, every alternatives are acceptable.

$\because (P/A, i\%, N) = \dfrac{1-(1+i)^{-N}}{i}$

so, $P.W_A = -12000 + 2500\,(P/A, 12\%, 8)$

$= -12000 + 2500\left(\dfrac{1-(1.12)^{-8}}{0.12}\right)$

$= -12,000 + 2500 \times 4.968$

$= \$420,$

Illy, $PW_B = -12500 + 2520\,(P/A, 12\%, 8) = \$19.36$

$PW_C = -14,400 + 3,050\,(P/A, 12\%, 8) = \$\,752.9$

$PW_D = 16250 + 3620\,(P/A, 12\%, 8) = \$\,1,734.16$

$PW_E = -20,000 + 4400\,(P/A, 12\%, 8) = \$\,1859.2.$

since alternative E has the highest P.W, it is economically best to choose.