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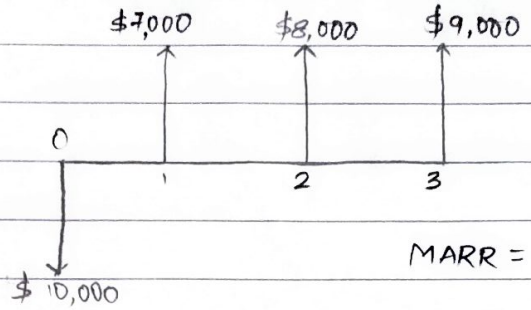
Q1.

a. (i)



MARR = 12%

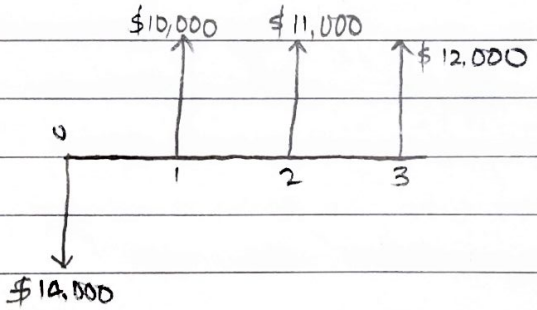
$$NPV = -P + F_1(P/F, I, N) + F_2(P/F, I, N) + F_3(P/F, I, N)$$

$$= -10,000 + 7,000(P/F, 12, 1) + 8,000(P/F, 12, 2) + 9,000(P/F, 12, 3)$$

$$= -10,000 + 7,000(0.8929) + 8,000(0.7972) + 9,000(0.7118)$$

$$NPV_x = \$9,034.1$$

(ii)



$$NPV_y = -P + F_1(P/F, I, N) + F_2(P/F, I, N) + F_3(P/F, I, N)$$

$$= -14,000 + 10,000(P/F, 12, 1) + 11,000(P/F, 12, 2) + 12,000(P/F, 12, 3)$$

$$= -14,000 + 10,000(0.8929) + 11,000(0.7972) + 12,000(0.7118)$$

$$NPV_y = \$12,239.8$$

b. IRR

(i) – (i) Guess 1 = 55%

$$PW_x = -P + F_1(P/F, i, N) + F_2(P/F, i, N) + F_3(P/F, i, N)$$

$$PW_x = -10,000 + 7000(P/F, 55, 1) + 8,000(P/F, 55, 2) + 9000(P/F, 55, 3)$$

$$= -10,000 + 7000(0.6452) + 8000(0.4162) + 9000(0.2685)$$

$$PW_x = 262.5$$

(i) – (i) Guess 2 – 60%

$PW_x = -10,000 + 7000(P/F, 60, 1) + 8000(P/F, 60, 2) + 9000(P/F, 60, 3)$

$= -10,000 + 7000(0.6250) + 8000(0.3906) + 9000(0.2441)$

$PW_x = (-303.3)$

$$y = y_1 + \frac{(x - x_1)(y_2 - y_1)}{(x_2 - x_1)}$$

$$= 55 + \frac{(-262.5)(5)}{-565.8}$$

$y = 57.3197\%$

(i) – (ii) Guess 1 – 55%

$PW_y = -14,000 + 10,000(P/F, 55, 1) + 11,000(P/F, 55, 2) + 12000(P/F, 55, 3)$

$= -14000 + 10,000(0.6452) + 11,000(0.4162) + 12000(0.2685)$

$PW_y = 252.2$

Guess 2 – 60%

$PW_y = -14,000 + 10,000(P/F, 60, 1) + 11,000(P/F, 60, 2) + 12,000(P/F, 60, 3)$

$= -14,000 + 10,000(0.6250) + 11,000(0.3906) + 12,000(0.2441)$

$= -524.2$

$$y = 55 + \frac{(-252.2)(5)}{-776.4}$$

$y = 56.6241\%$

Q 1.

b (ii) → On Excel.

c

N	Project X	Project Y	Y − X
0	−10,000	−14,000	−4000
1	7,000	10,000	3000
2	8,000	11,000	3,000
3	9,000	12,000	3,000

$PW_{y-x} = -P + A(P|A, I, N)$ $\quad I \rightarrow$ Guess 1 = 50%

$= -4,000 + 3,000\ (P|A, 50, 3)$

$= -4,000 + 3,000(1.4074)$

$PW_{y-x} = 222.2$

$PW_{y-x} = -4,000 + 3,000\ (P|A, 55, 3)$

$= -4,000 + 3,000(1.3299)$

$PW_{y-x} = (-10.3)$

$$y = y_1 + \frac{(x - x_1)(y_2 - y_1)}{(x_2 - x_1)}$$

$$= 50 + \frac{(-222.2)(5)}{-232.5}$$

$IRR = 54.7785$

IRR > MARR

∴ Select Project Y

Q2.

a. (i) Program 1.

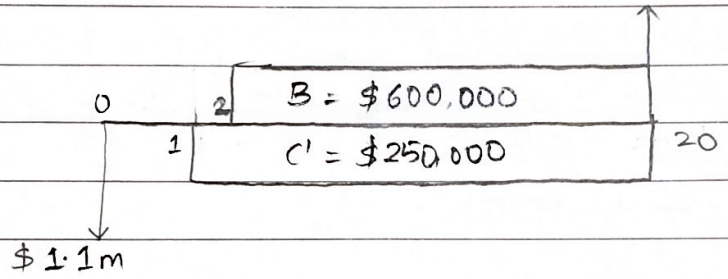
Initial cost (I) = $ 1,100,000

O & M (C') = $ 250,000

Savings & Benefits (B) = $ 600,000

Period (N) = 20

Interest Rate (i) = 14%



$PW_B = [600000 (P|A, 14\%, 19)] (P|F, 14\%, 1)$

$= 600000 (6.5504) (0.8772)$

$= \$ 3,447,606.53$

$PW_{C'} = A (P|A, 14\%, 20)$

$= 250,000 (6.6231)$

$= \$ 1,655,775$

$PW_{BCR(i)} = B/C$

$= \frac{3,447,606.53}{2,755,775}$

$BCR = 1.25$

$PW_I = \$ 1,100,000$

Conclusion: Good Investment, Accept

$PW_C = PW_I + PW_{C'}$

$= 1,100,000 + 1,655,775$

$= \$ 2,755,775$

Q2

a. (ii) Program 2.

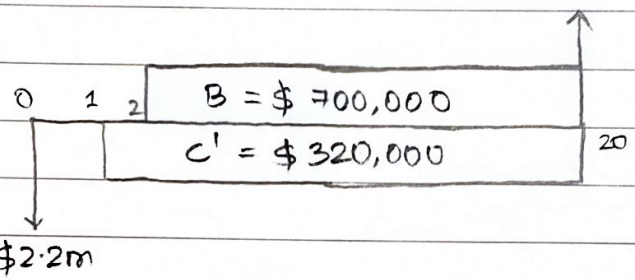
Initial cost (I) = $ 2,200,000

O & M (C') = $ 320,000

Savings & Benefits (B) = $700,000

Period (N) = 20 years

Interest Period (i) = 14%



$PW_B = [700000 (P|A, 14%, 19)] (P|F, 14%, 1)$

$= 700000 (6·5504)(0·8778)$ $= \$4,022,207·62$

$PW_{C'} = 320000 (6·6231)$

$= \$2,119,392$

$PW_I = \$2,200,000$

$PW_C = PW_I + PW_{C'}$

$= \$4,319,392$

$PW_{BCR(i)} = B/C$

$BCR = 0·93$

conclusion : Bad Investment, Reject.

Q.2

b.

	Project X	Project Y
B	$3,447,520	$ 4,022,130
I	$1,100,000	$ 2,200,000
C	$2,755,775	$ 4,319,392

$$BCR(14\%)_{Y-X} = \frac{B_Y - B_X}{C_Y - C_X}$$

$$= \frac{4,022,207.62 - 3447606.53}{4319392 - 2755775}$$

$$= 0.37$$

BCR < 1

Select project X.