Problem 5 :-

f) given IRR = 5% & life = 5 yrs

i) fully automatic Machine

initial cost → $800,000
Salvage (5 yrs) → $80,000 & Profit = $1.00/unit
Oper. cst → $ 0.1/cell

a) Annual = IC (A/P, 5%, 5) − S (A/F, 5%, 5) + OC − Profit.
(A/P, 5%, 5): from table; (A/F, 5%, 5): from table

$= 8\times10^5(0.231) - 8\times10^4(0.181) + 0.1N - 1N$

(a) $= 170320 - 0.9N$ (with OC) → (1)

(b) $= 170320 - 1N$ (without OC) → (2)

ii) Semi-Automatic Machine.

(Same formula as i)

Annual cost $= 500000\times(A/P, 5\%, 5) - 50,00(A/F, 5\%, 5) + 0.4N - 1N$

$= 500000\times(0.231) - 50,000(0.1810) - 0.6N$

$= 106,450 - 0.6N$ → (3)

&

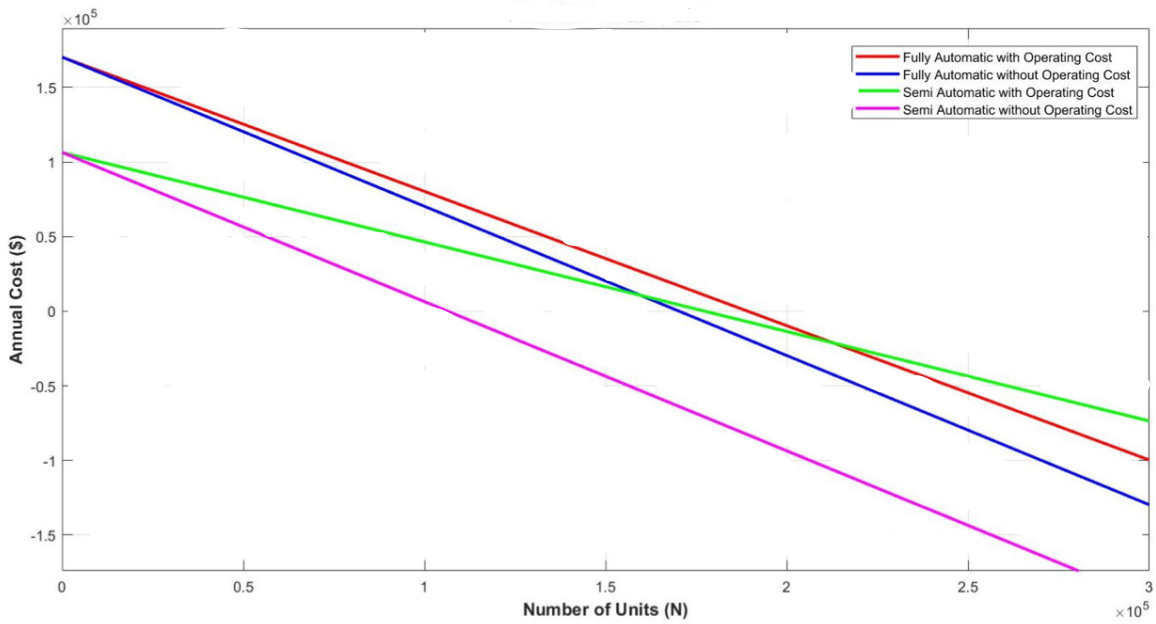
Ann cost (without Operation Cost) $= 106,450 - 1N$ → (4)

iii) for break even equate ① & ④

$$170{,}320 - 0.9N = 106{,}450 - 0.6N$$

$$\Rightarrow N = 212{,}900 \text{ units}$$

iv) Plotting ①, ②, ③ & ④



Semi-automatic machine has lower annual cost for units less than 212,900, in comparision to fully-automatic machine. Hence semi-automatic, will yeild better profits.

g)

IRR = 5% (No tax / Salvage)

Life = 5 yrs

Initial cost = $500,000 | Production = 120,000 Units/yr.

$P(B)_{B=0.8} = 0.8$ & $P(B)_{B=1} = 0.2$

$P(n)_{n=5} = 0.4$ & $P(n)_{n=4} = 0.6$

Present Value = $-500,000 + P(B=0.8) * (P/A, i=5\%, n=5/4)$

Present Value Compound = Present Value * $P(B,n)$

→ Benifits at $B = 0.8$ = $0.8 \times 120,000$
= 96,000

and at $B = 1$ = $1 \times 120,000$
= 120,000

at

i) $B = 96,000$, $n = 5$ ⇒ $P(B,n) = 0.8 \times 0.4$ ⇒ $P(B,n) = 0.32$ ⇒ PW = $-500,000 + 96000 \times (4.3294)$ = $-84,377.60$

& $PW_{compound} = -27,000.83$

ii) $B = 96,000$, $n = 4$ ⇒ $P(B,n) = 0.8 \times 0.6$ ⇒ $P(B,n) = 0.48$ ⇒ PW = $-500,000 + 96000 \times (3.5459)$ = $-159,593.60$

& $PW_{compound} = -76,604.93$

iii) $B = 120,000 \Rightarrow P(B,n) = 0.2 \times 0.4 \Rightarrow PW = -500,000 + 120000 \times 4.3294$
$n = 5$ $= 0.12$ $= 19,528.00$

$\therefore PW_{\text{compound}} = 1,562.24$

iv) $B = 120,000 \Rightarrow P(B,n) = 0.2 \times 0.6 \Rightarrow PW = -500,000 + 120000 \times 3.5459$
$n = 4$ $= 0.12$ $= -74,492.00$

$\therefore PW_{\text{compound}} = -8,939.04$

→ Hence, the Present Value of a given machine under the above condition is -$10,982.56 which means it is not a good investment option.

h)

IRR = 5%. (No tax / Salvage)

Life = 5 yrs

Initial cost = $500,000 | Production = 120,000 Units/yr.

Nominal Profit = $1.00/unit.

Variations → ± 20% in Profit

i.e

$96,000/yr (−20%)

$120,000/yr (0%)

$144,000/yr (±20%)

Variations → ± 20% Variation in Life.

4 yrs (−20%)

5 yrs (0%)

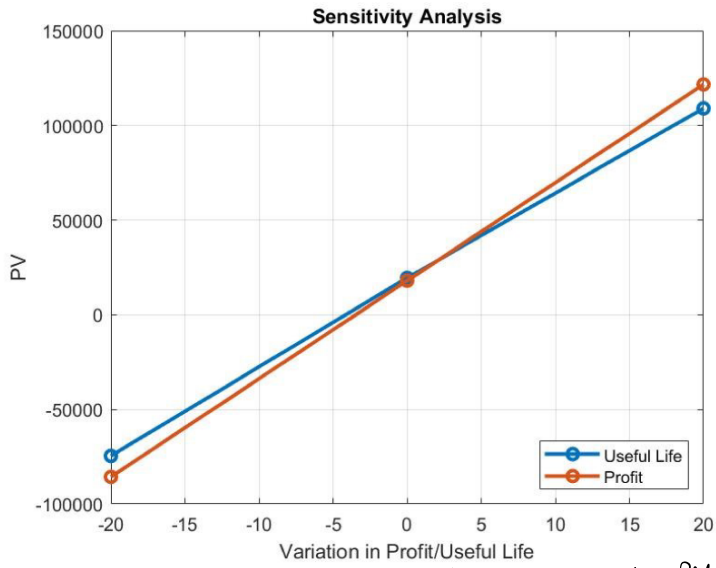
6 yrs (± 20%)

Nominal Present Value = −500,000 + 120,000 (4.3294)

= 19,528.00

For the plotting part ↓

			Useful Life Variation			Average PV for Profit
			-20%	0%	+20%	
			P|A(5%,4)	P|A(5%,5)	P|A(5%,6)	
Profit Variation	-20%	96,000	-159,593.60	-84,377.60	-12,742.40	-85,571.20
	0%	120,000	-74,492.00	19,528.00	109,072.00	18,036.00
	+20%	144,000	10,609.60	123,433.60	230,886.40	121,643.20
Average PV for Useful Life			-74,492.00	19,528.00	109,072.00	



Variations in profit and useful life clearly impacts the PV. of the project. The PV values are significantly lower when the profit and useful life is reduced by 20%.