

METHODS FOR MAKING ECONOMY STUDIES

E.1.

BY ROR METHOD:

INVESTMENT	270,000
SALVAGE VALUE	27,000
REVENUE	185,400

FOR ANNUAL COST:

OP & MAINT. 81,000

TAX & INS. $(0.04 \times 270,000)$ 10,800

DEPRECIATION $\frac{270,000 - 27,000}{F/A, 25\%, 5}$

$$\frac{270,000 - 27,000}{\left[\frac{(1.25)^5 - 1}{0.25} \right]} = 29,608.76$$

TOTAL A.C. 121,408.76

NET ANNUAL PROFIT = ANNUAL REVENUE - ANNUAL COST

$$= 185,400 - 121,408.76$$

NET ANNUAL PROFIT = 63,991.24

$$ROR = \frac{63,991.24}{270,000.00} \times 100\% = 23.70\%$$

CONCLUSION: SINCE ROR IS LESS THAN 25%,
THE INVESTMENT IS NOT JUSTIFIED.

BY USING ANNUAL WORTH

ANNUAL COST (SEE ROR METHOD)	121,408.76
INTEREST ON CAPITAL $(0.25 \times 270,000)$	67,500.00

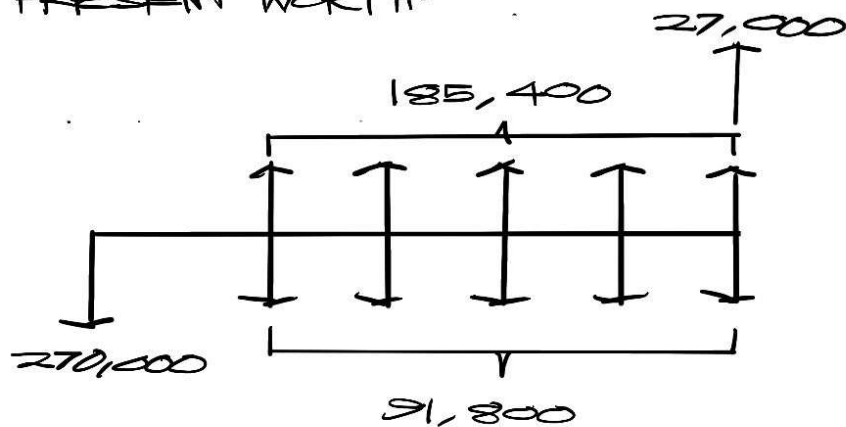
TOTAL A.C.: 188,908.76

NET ANNUAL PROFIT = 185,400 - 188,908.76

$$= -3,508.76$$

CONCLUSION: SINCE THE ANNUAL PROFIT (-3,508.76)
IS LESS THAN ZERO, THE INVESTMENT IS
NOT JUSTIFIED.

BY USING PRESENT WORTH



$$\text{ANNUAL COST (EXCLUDING DEPRECIATION)} = 10,800 + 81,000 \\ = 91,800$$

FOR CASH INFLOWS:

$$P_{\text{INFLOW}} = 185,400 [P/A, 25\%, 5] + 27,000 [P/F, 25\%, 5] \\ = 185,400 \left[\frac{1 - (1.25)^{-5}}{0.25} \right] + 27,000 (1.25)^{-5}$$

$$P_{\text{INFLOW}} = 507,439.87$$

FOR CASH OUTFLOWS:

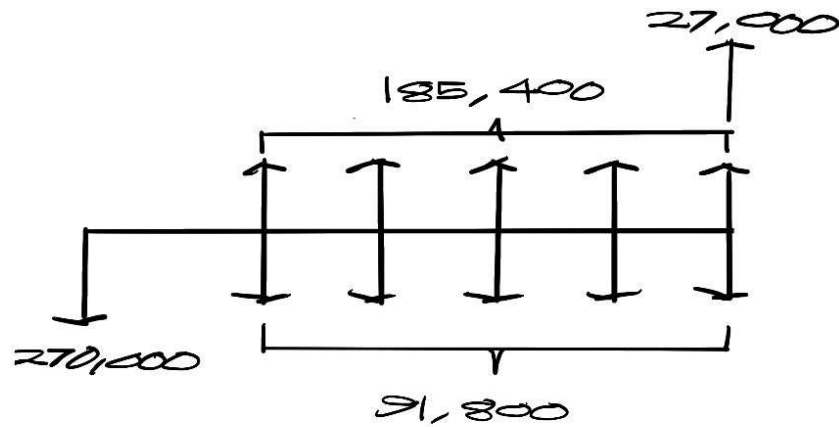
$$P_{\text{OUTFLOW}} = 270,000 + 91,800 [P/A, 25\%, 5] \\ = 270,000 + 91,800 \left[\frac{1 - (1.25)^{-5}}{0.25} \right]$$

$$P_{\text{OUTFLOW}} = 516,875.90$$

$$\text{NET CASH FLOW} = 507,439.87 - 516,875.90 \\ = -9,436.03$$

CONCLUSION: SINCE THE NET CASH FLOW IS LESS THAN ZERO THE INVESTMENT IS NOT JUSTIFIED

BY USING FUTURE WORTH:



FOR INFLOW:

$$F_{\text{INFLOW}} = 185,400 [F/A, 25\%, 5] + 27,000$$
$$= 185,400 \left[\frac{(1.25)^5 - 1}{0.25} \right] + 27,000$$

$$F_{\text{INFLOW}} = 1,548,583.59$$

FOR OUTFLOW:

$$F_{\text{OUTFLOW}} = 270,000 [F/P, 25\%, 5] + 91,800 [F/A, 25\%, 5]$$
$$= 270,000 (1.25)^5 + 91,800 \left[\frac{(1.25)^5 - 1}{0.25} \right]$$
$$F_{\text{OUTFLOW}} = 1,577,380.08$$

$$\text{NET CASH FLOW} = 1,548,583.59 - 1,577,380.08$$
$$= -28,796.49$$

CONCLUSION: SINCE THE NET CASHFLOW IS LESS THAN ~~ZERO~~
THE INVESTMENT IS NOT JUSTIFIED

FOR PAYBACK PERIOD:

$$\text{TOTAL ANNUAL COST} = 91,800$$

$$\text{NET CASHFLOW} = 185,400 - 91,800 = 93,600$$

$$\text{PAYBACK PERIOD} = \frac{270,000 - 27,000}{93,600}$$

$$\text{PAYBACK PERIOD} = 2.6 \text{ YRS}$$

E.5

BY USING ROR ON ADDITIONAL INVESTMENT:

	TYPE A	TYPE B
OP COST	32,000	34,000
LAB COST	50,000	32,000
PAYROLL TAX	$0.04 \times 50,000 = 2,000$	$0.04 \times 32,000 = 1,280$
TAX & INS.	$0.03 \times 200,000 = 6,000$	$0.03 \times 300,000 = 9,000$
TOTAL	90,000	66,280
DEPRECIATION	$\frac{200,000 - 0}{F/A, 15\%, 10} = \frac{200,000}{\left[\frac{(1.15)^{10} - 1}{0.15} \right]}$ = 9,850.41	$\frac{300,000 - 0}{F/A, 15\%, 10} = \frac{300,000}{\left[\frac{(1.15)^{10} - 1}{0.15} \right]}$ = 14,775.62
TOTAL ANNUAL COST	99,850.41	81,055.62

$$ROR = \frac{|99,850.41 - 81,055.62|}{|200,000 - 300,000|} \times 100\% = 18.79\%$$

CONCLUSION: SINCE ROR IS SATISFACTORY ($18.79\% > 15\%$),
TYPE B SHOULD BE SELECTED.

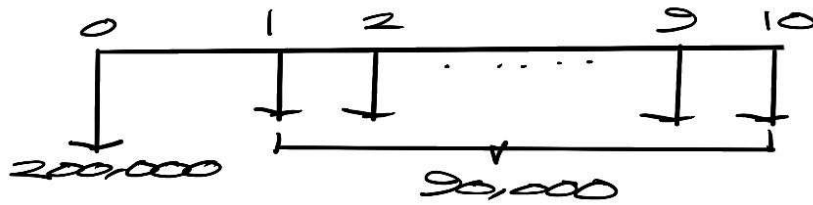
USING ANNUAL COST

	TYPE A	TYPE B
ANNUAL COST (SEE ROR)	99,850.41	81,055.62
INTEREST ON CAPITAL	$0.15 \times 200,000 = 30,000$	$0.15 \times 300,000 = 45,000$
TOTAL ANNUAL COST	129,850.41	126,055.62

CONCLUSION: SINCE THE ANNUAL COST OF TYPE B $<$ TYPE A,
TYPE B SHOULD BE SELECTED.

BY USING PRESENT WORTH COST:

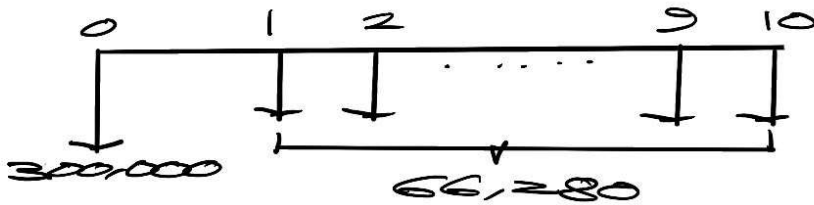
TYPE A:



$$P_A = 200,000 + 90,000 [P/A, 15\%, 10] = 200,000 + 90,000 \left[\frac{1 - 1.15^{-10}}{0.15} \right]$$

$$P_A = 651,689.18$$

TYPE B:



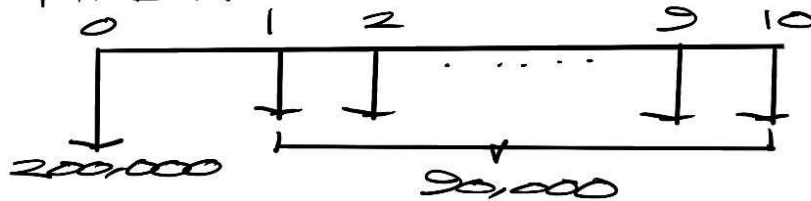
$$P_B = 300,000 + 66,280 [P/A, 15\%, 10] = 300,000 + 66,280 \left[\frac{1 - 1.15^{-10}}{0.15} \right]$$

$$P_B = 632,643.98$$

CONCLUSION: SINCE THE PRESENT WORTH COST OF TYPE B < TYPE A
TYPE B SHOULD BE SELECTED.

BY USING EQUIVALENT UNIFORM ANNUAL COST:

TYPE A:

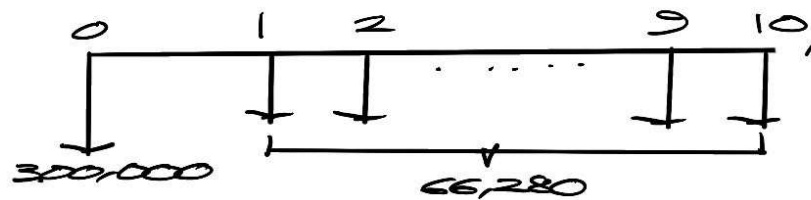


$$EUAC_A = 90,000 + 200,000 [A/P, 15\%, 10]$$

$$= 90,000 + 200,000 \left[\frac{0.15}{1 - (1.15)^{-10}} \right]$$

$$EUAC_A = 129,850.41$$

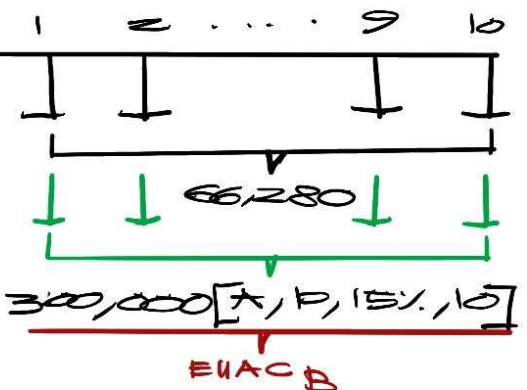
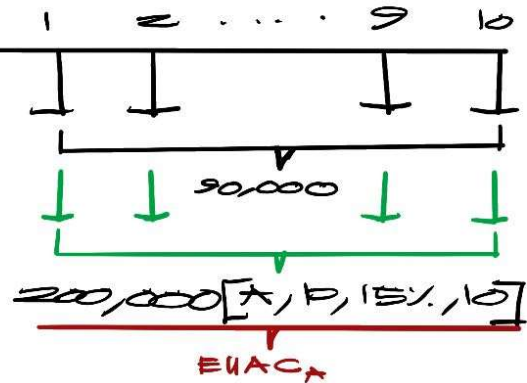
TYPE B:



$$EUAC_B = 66,280 + 300,000 [A/P, 15\%, 10]$$

$$= 66,280 + 300,000 \left[\frac{0.15}{1 - (1.15)^{-10}} \right]$$

$$EUAC_B = 126,055.62$$



CONCLUSION: SINCE THE $EUAC_B < EUAC_A$, TYPE B
SHOULD BE SELECTED.