

Time : 45 minutes

Question (1)

A company is in need to the services of a special machine for 8 years. Two competing machines A & B are offered for sale with data shown below :

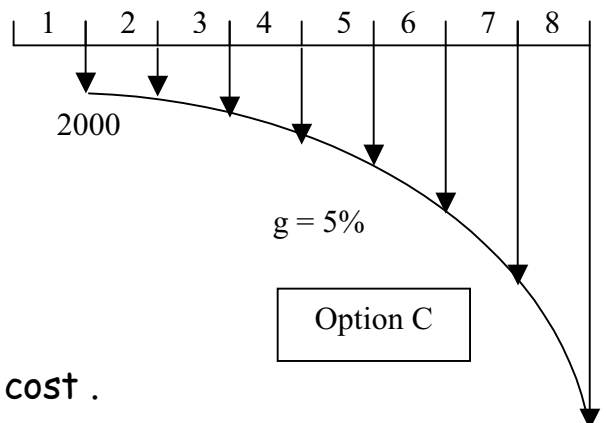
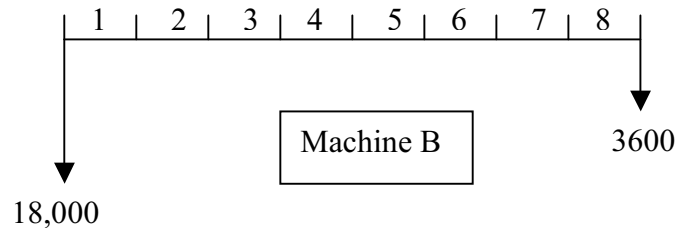
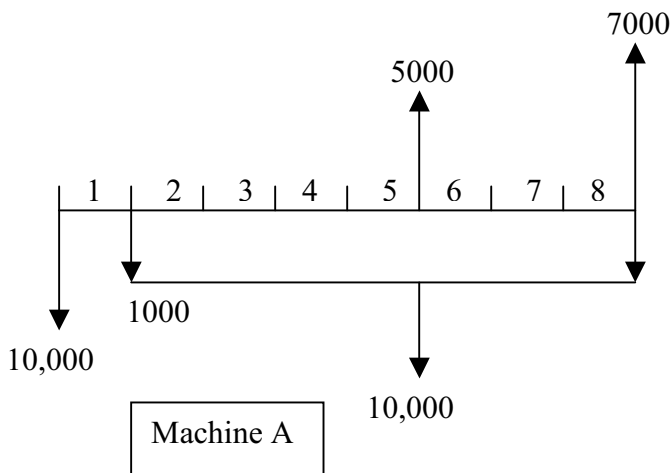
	A	B
Initial cost	10,000	18,000
Useful life	5 years	12 years
Annual maintenance	1,000	0

The market value of machine A decreases by 10% of its initial cost per year while the market value of machine B decreases by 15% of its initial cost per year. However as another option, the needed service could also be obtained by another company for 2000\$ this year and increasing by 5% per year thereafter. Assume your MAR = 10%. Answer the following :-

- a) List all feasible alternatives by **drawing a cash flow diagram for each alternative .**
- b) Using annual worth on total investment approach, which alternative is best ?

Sol :

(a) Study period = $n^* = 8$ years .



(b) $EUAC_A (10 \%) \approx 2844$
 $EUAC_B (10 \%) \approx 3689$
 $EUAC_C (10 \%) \approx 2330$

Conclusion \longrightarrow option C is best \longrightarrow least cost .

Question (2)

Give four mutually exclusive alternatives, each with a useful life of 20 year and no salvage value. Using 10% interest rate the following data were obtained :

	A	B	C	D
PW of costs	\$3,800	\$9,000	\$6,200	\$2,000
PW of benefits	6,200	11,400	7,700	4,700

Conduct benefit-cost (B / C) ratio approach to determine the best alternative.

Sol :

1- Rank alt. according to initial cost D → A → C → B

2- Consider D as our best alt. so far .

3- Compare D with alt. A, By considering the increment

$$(B / C)_{A-D} = \frac{6200 - 4700}{3800 - 2000} = \frac{1500}{1800} < 1$$

Conclusion → D is our best alt. so far .

4- Consider C - D

$$(B / C)_{C-D} = \frac{7700 - 4700}{6200 - 2000} = \frac{3000}{4200} < 1$$

Conclusion → D is our best alt. so far .

5- Consider B - D

$$(B / C)_{B-D} = \frac{11400 - 4700}{9000 - 2000} = \frac{6700}{7000} < 1$$

Conclusion → D is our best alt. so far .

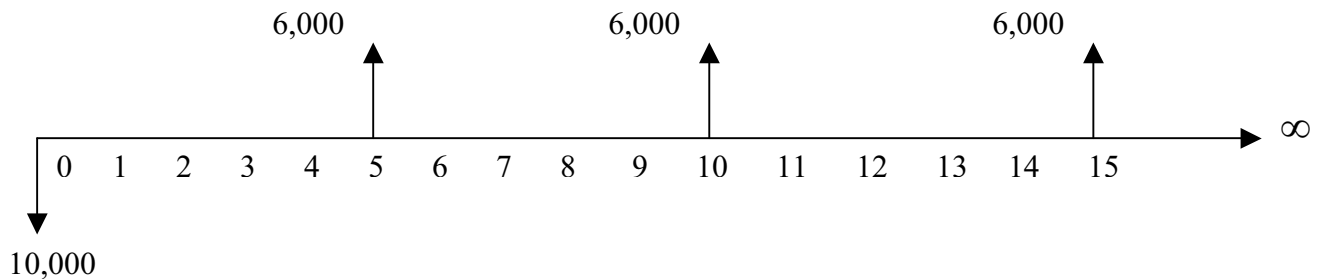
Conclusion: D is the best alt.

Question (3)

Consider the cash flow diagram shown below, and answer the following :

- (a) Write the equation that calculates the rate of return .
- (b) Calculate the rate return .
- (c) Assuming that your MAR exactly equals the rate of return, what is the payback period ?

Show your work (calculations) for part (b) & (c)



Sol :

$$(a) 10,000 * (1 + i)^5 = 16000$$
$$(1 + i)^5 = 1.6$$

$$(b) i = (1.6)^{\frac{1}{5}} - 1 \approx 9.856\%$$

(c) $n^* = 10$ years (periods) Simple payback period.
It has nothing to do with your MAR .