06/09

(135)

CMR INSTITUTE OF TECHNOLOGY

**Internal Assessment Test 1 – Sept 2016**

| Sub: | Engineering Economics | | Code: | 10ME71 |
|---|---|---|---|---|
| Date: 06/ 09/ 2016 | Duration: 90 mins | Max Marks: 50 Sem: VII | Branch: | Mech |

**Note:** Answer Any 5 questions. Each question carries 10 marks.

1. a) What is decision making? Explain importance of decision making in engineering economics
   b) Explain with a neat sketch Law of Demand and Law of Supply.

2. Four million rupees are donated to a college, 20 students are to be awarded scholarships over next 20 years. Scholarships are each of Rs. 12,000 for first year and there after increases by Rs.1, 800 per year over the following 19 years. Starting with end of fifth year Rs. 16,000 is spent for maintenance of college building. The cost rises linearly at the rate of Rs.1, 900 starting with sixth year. Assume interest rate 10 percent and determine how much money will be available to construct auditorium now using present worth method.

3. An aircraft assembly fixture has a purchase price of Rs. 10 lakh and classed as 7 year property. Use of fixture is expected to result in an annual before tax savings of Rs. 3.75 lakh for a period of 7 years, assume salvage value is 0.
   Determine (i) The before tax present worth of investment at interest rate of 30 percent.
   (ii)The after tax, present worth of investment with tax rate 34percent and interest rate 25 percent.

4. a) Management of engineering college has granted Rs.10 crore for construction of new mechanical science block. Annual maintenance of block is expected to be Rs10 lakh. In addition Rs.12 lakh will be needed every year for painting and major repairs. If budget granted has to take care of maintenance, how much of the amount can be used for initial construction cost? Deposited funds can earn 6% rate of interest, compounded annually.
   b) An initial investment of Rs. 30,000 is made on a milling machine, the annual receipts and expenditures are Rs 23,400 and Rs 5,700. The life of machine is 7 years and for an interest rate of 8%. Calculate the payback period.

5. Two types of power converters Alpha and Beta are under consideration for a particular application. An economic comparison is made at interest rate of 10%. Following cost estimation has been obtained. Determine the annual equivalent costs of the two systems, select the best converter.

| Cost particulars | Alpha | Beta |
|---|---|---|
| Purchase price | Rs.10,00,000/- | Rs.10,20,000/- |
| Estimated service life | 5 years | 5 years |
| Salvage value | Rs.23,000/- | Rs.30,000/- |
| Annual operating cost | Rs.7,000/- | Rs.9,000/- |

6) A company wants to expand its storage facility, Three alternative site design proposals are available.

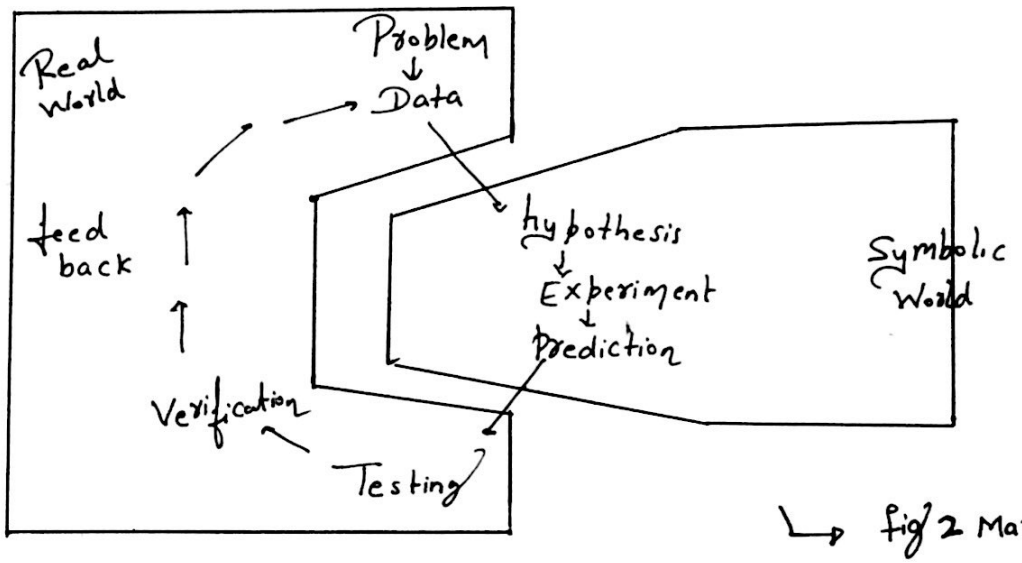
| Particulars | Proposal A | Proposal B | Proposal C |
|---|---|---|---|
| Land Cost | 3,40,000 | 4,10,000 | 5,12,000 |
| Building & installation | 60,000 | 78,00,000 | 87,00,000 |
| Annual energy cost | 45,000 | 54,000 | 32,000 |
| Increase each year | 3,000 | 2,000 | 1,000 |
| Annual maintenance cost | 20,000 | 18,000 | 15,500 |
| Revenue generated/year | 2,40,000 | 2,40,000 | 2,40,000 |
| Salvage value | 32,000 | 35,000 | 26,000 |
| Life in Years | 7 | 7 | 7 |

If minimum required rate of return is 15%per year, which proposal should be selected by future worth comparison method?

# ENGG ECONOMICS

## IAT-I Solution

1A) Decision Making:-




↳ fig/2 Marks

→ Scientific Method is the fundamental Approach to solve problem in Engg Economics using data from real world and Symbolic World.

→ The problem is defined by data obtained in real World

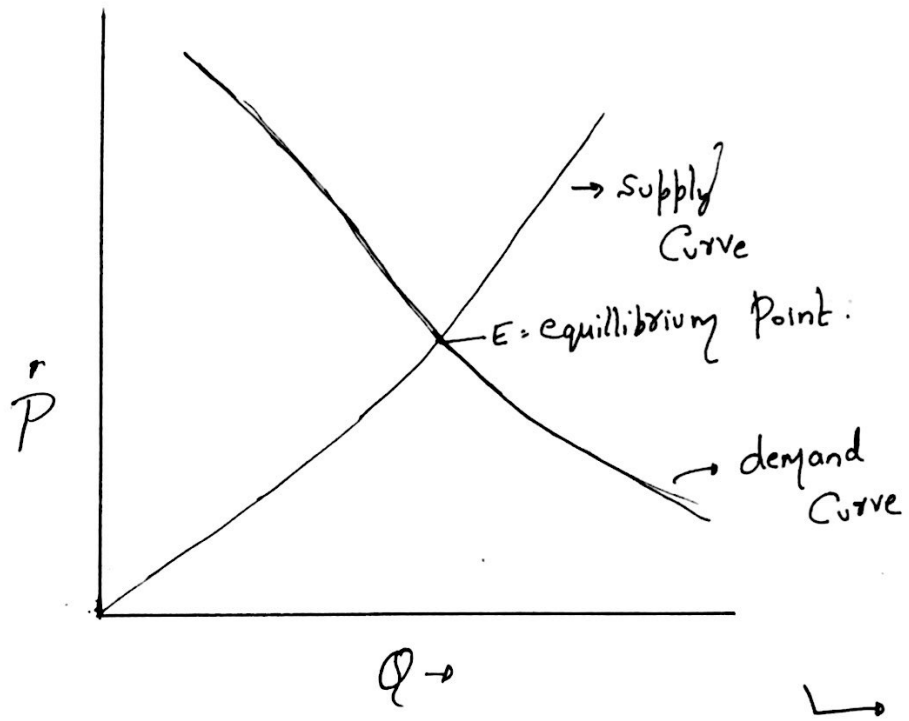
→ Information is Subjected to Analysis by Scientific approach

→ Solution is formulated with hypothesis, testing & Experimentation.

↳ Explanation 3 Marks

→ Solution is Applied in real world.

## LAW of Demand & Supply




↳ fig 2 Marks

## Demand vs Supply.

LAW of Demand :-

Demand for Commodity Increases as price decreases and Vice Versa, all the other things remain Same. $D \propto 1/P$

LAW of Supply :-

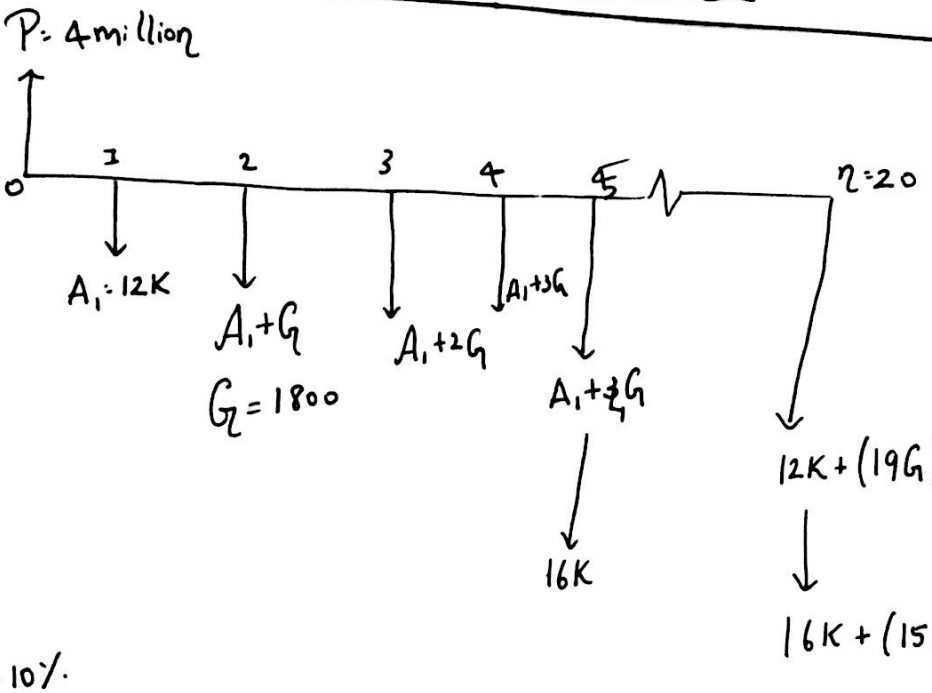
The Supply for Commodity Increases as price Increases and Vice Versa. Supply is directly proportional to price.

↳ Explanation 3M

$S \propto P$

# Solution IAT-I

2A).




→ C.F.D

3 Marks

i = 10%.

## Scholarship

$A_1 = 12000/-$

$G = 1800/-$

$A = A_1 + G(A/G\ 10\%\ 20)$

$\boxed{A = ₹\ 23714.54/-}$ → 1M

$P_w(A) = A \cdot (P/A\ i\%\ n)$

$\boxed{P_w(A) = ₹\ 2,01,895.19/-}$ → 2M

## Maintainance :-

$A_1 = 16,000/-$

$G = 1900$

$A = A_1 + G(A/G\ 10\%\ 16)$

$\boxed{A = 26543.746/-}$

$P_w(A) = A(P/A\ i\%\ n)$

$= 26543.7(P/A\ 10\%\ 11)$

$\boxed{P_w(A) = 2,07,670.571/-}$

↓ 2M

$P_w(A) = F(P/F\ 10\%\ 5)$

$\boxed{P_w(A) = 1,28,946.8/-}$ → 2M

3A) Data:- P = ₹ 10,00,000/-

n = 7 years

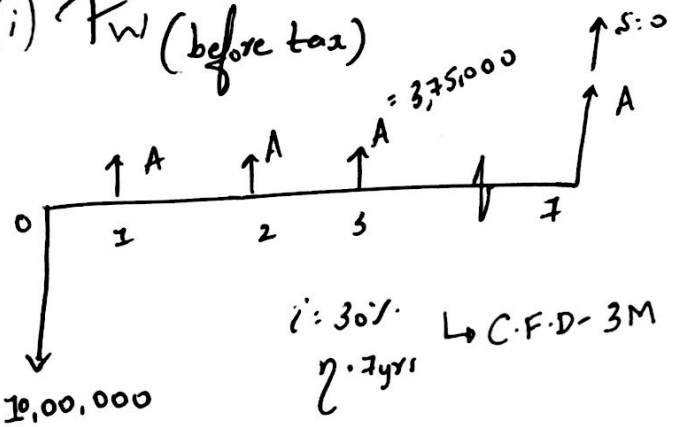
A (before tax) = ₹ 3,75,000/-

i = 30% (bef tax)

i = 25% (after tax)

tax = 34%

(i) PW (before tax)




i = 30% ↳ C.F.D - 3M

n = 7 yrs

$PW = PW_{(revenue)} - PW_{(cost)}$

$= 3,75,000\ (P/A\ 30\%\ 7) - 10,00,000$

$NPV = \boxed{₹\ 50,787.5/-}$

↳ 4 Marks

(ii) PW (after tax)

$PW = 2,47,500\ (P/A\ 25\%\ 7)$

$NPW = 1,82,372.25 - 10,00,000$

$NPW_{(after\ tax)} = \boxed{₹\ -2,17,627.75}$

↓ 3 Marks.

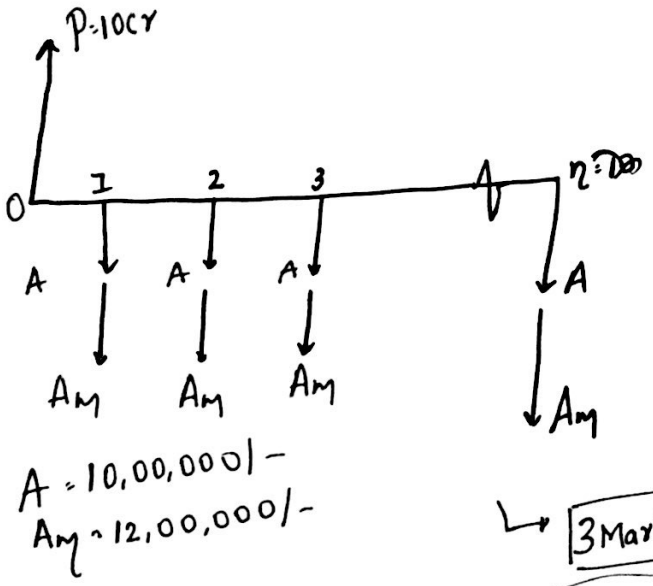
4a) Data:-

$P = ₹ 10\,cr$

$A = ₹ 10,00,000/-$

$A_M = ₹ 12,00,000/-$

$i = 6\,\%$




$A = 10,00,000/-$

$A_M = 12,00,000/-$

↳ 3 Marks

Capital Cost (10 cr) = Init. Inv + $\frac{TAC}{i\%}$

$I.I = 10,00,00,000 - \frac{10L + 12L}{0.06}$

$I.I = \boxed{₹ 6,33,33,333.33/-}$

Available resource for Construction → ₹ 3,66,66,666.67/-

↓

3 Marks

4b) $P = ₹ 30,000/-$

$A_{rec} = ₹ 23,400/-$

$A_{exp} = ₹ 5700/-$

$n = 7$

$i = 8\%$

Pay back Period = $\frac{I.I}{A_r - A_e} = \frac{30,000}{23,400 - 5700}$

↓ 2 Marks

Pay back Period = 1.69 yrs.

↓

2 Marks.

5) For Alpha.

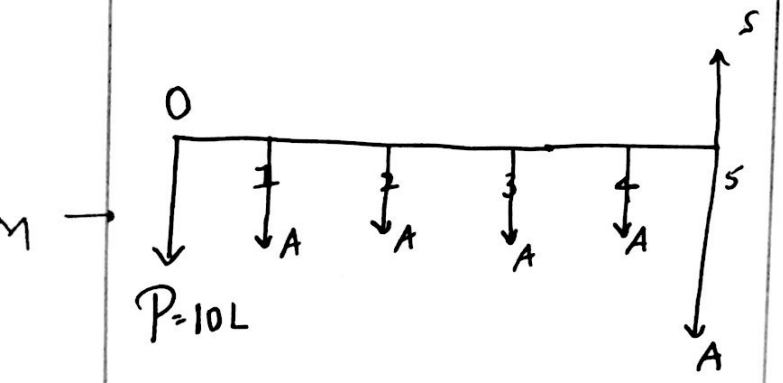
$P = ₹10,00,000/-$

$A = ₹7,000/-$

$S = ₹23,000$

$n = 5yrs$

$i = 10\%$.




$AEW = AE(R) - AE(C)$

$AW(rev) = S.(A/F\ i\%.\ n)$

$23000\ (A/F\ 10\%.\ 5)$

$AW(rev) = ₹3767.4$

$AW(cost) = P.(A/P\ i\%.\ n) + A$

$= 10L.(A/P\ 10\%.\ 5) + 7000$

$= 2,70,800/-$

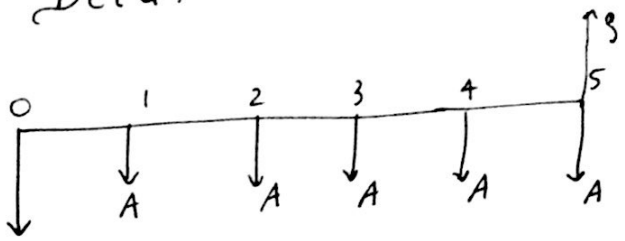
$AEW = 3767.4 - 270800$

$\boxed{AEW\ (Alpha) = ₹-2,67,032.6/-}$

↓

3M

Beta.




$P = 10,20,000$

2M

$S = 9000/-$

$A = 30,000/-$

$n = 5\ ;\ i = 10\%$.

$AEW = AE_{(rev)} - AE_{(cost)}$

$AEW = S(A/F\ 10\%.\ 5) - [P.(A/P\ i\%.\ n) + A]$

$= 9000\ (0.1638) - [10,20,000(0.2638) + 30000]$

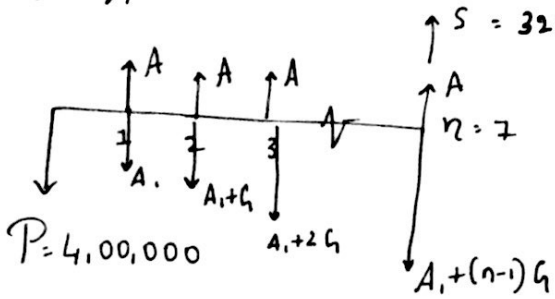
$\boxed{AEW_{(Beta)} = ₹-2,97,601.8/-}$

↓

2M

Alpha is the Best Converter.

6A) Proposal A.




$i = 15\%$

$n = 7$

$A = 2,40,000$

$P = 3,40,000 + 60,000$

$P = 400000/-$

$A_1 = 65000/-$

$G = 3000/-$

$FW = FW(R) - FW(C)$

(Prop A)

$= S + A\,(F/A\ i\%\ n)$

$= ₹\ 2688032$

$FW_{Cost} = P\,(F/P\ i\%\ n) + [A_1 + G(A/G\ i\%\ n)]\ (F/A\ i\%\ n)]$

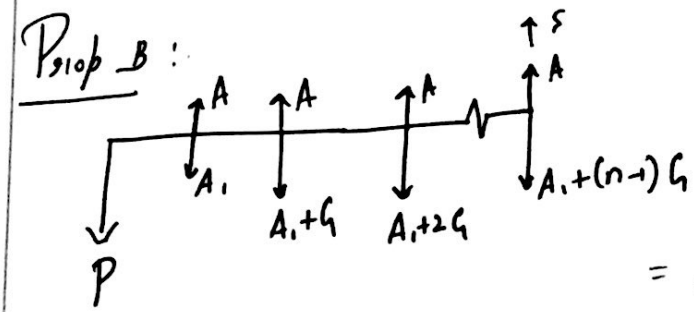
$= 4,00,000\,(2.6600) + [65000 + 3000\,(2.4498)]\ (11.0668)$

$FW(cost) = ₹\ 18,64,676.34$

$FW(A) = 26,88,032 - 18,64,676.3$

$\boxed{FW(A) = ₹\ 823355.66/-}$ → 4 Marks

Prop B :



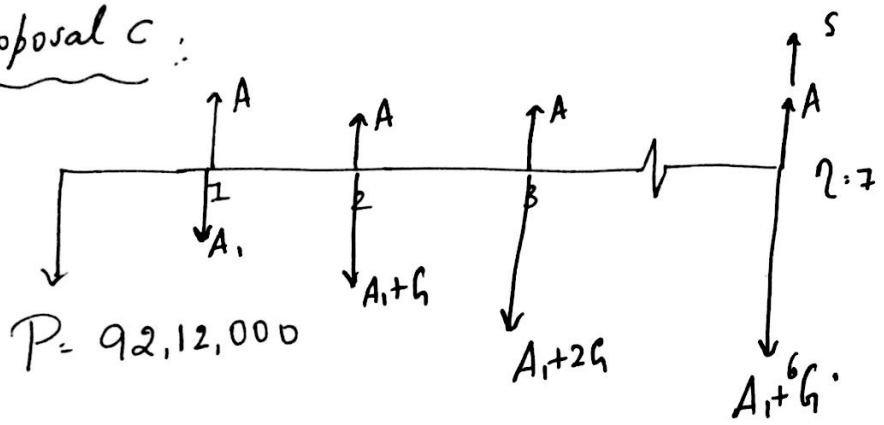

$FW_{(B)} = FW(R) - FW(C)$

$= S + A\,(F/A\ 15\%\ 7) - [P\,(F/P\ 15\%\ 7) +$

$A_1 + G(A/G\ 15\%\ 7)]\ (F/A\ 15\%$

$FW_{(B)} = \boxed{₹\ -23,98,43,419/-}$ → 3M

Proposal C :




$$FW_{(c)} = FW_{(R)} - FW_{(c)}$$

$$= 26,000 + 240,000(11.0668) - [92,12,200(2.6600) + (47500 + 1000(2.4498)](11.0668)$$

$$FW_{(c)} = ₹ -26,90,50,734.3/-$$ → 3M

Proposal A is selected.