

[5254]-40

**B.E. (Mechanical Engineering)****QUANTITATIVE AND DECISION MAKING TECHNIQUES****(2008 Pattern) (Elective - II) (Theory)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Answer any three questions from each section.
- 3) Answer to the two sections should be written in separate books.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Figures to the right indicate full marks.
- 6) Use of non-programmable calculator is allowed.
- 7) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Explain steps in decision making. [5]
- b) Explain decision tree with suitable example. [5]
- c) Solve following problem by mixed strategy method. [6]

		B's Strategy	
		B1	B2
A's Strategy	A1	- 4	5
	A2	3	-7

OR

- Q2)** a) Explain [8]
- i) Pure and Mixed Strategies
  - ii) Graphical method for solving Game Problem.
- b) Solve following  $4 \times 4$  Game Problem. [8]

	B1	B2	B3	B4
A1	5	- 4	- 4	6
A2	-3	- 2	- 3	- 6
A3	6	8	- 4	-1
A4	7	3	-9	-3

**P.T.O.**

**Q3) a)** Define OR and explain its scope. [6]

b) Solve following LPP Problem with Simplex Method. [10]

$$\text{Maximize } Z = 4x_1 + 3x_2 + 6x_3$$

$$\text{Subjected to } 2x_1 + 3x_2 + 2x_3 \leq 440$$

$$4x_1 + 3x_3 \leq 470$$

$$2x_1 + 5x_2 \leq 430$$

$$x_1, x_2, x_3 \geq 0$$

OR

**Q4) a)** Sketch special cases in graphical solution of LPP. [4]

b) Solve following problem by Big M method. [12]

$$\text{Minimize } Z = 5x_1 + 3x_2$$

$$\text{Subjected to } 2x_1 + 4x_2 \leq 12$$

$$2x_1 + 2x_2 = 10$$

$$5x_1 + 2x_2 \geq 10$$

$$x_1, x_2 \geq 0$$

**Q5) a)** Explain Hungarian method of solving assignment problem. [8]

b) Five different machines can do any of five required components with different machining time resulting from each assignment as shown in table below. Find out minimum machining time possible through optimum assignment. [10]

MACHINE

COMPONENT		1	2	3	4	5
	A	160	130	175	190	200
	B	135	120	130	160	175
	C	140	110	155	170	185
	D	50	50	80	80	110
	E	55	35	70	80	105

OR

- Q6) a)** Explain North West Corner method of allocation for transportation problem. [6]
- b)** A company has factories at F1, F2 and F3 that supply products to warehouses at W1, W2 and W3. The weekly production of factories is 200, 160 and 90 units respectively and the weekly demand of warehouses is 180, 120 and 150 units respectively. The unit shipping costs in rupees is below. [12]

1	W1	W2	W3
F1	16	20	12
F2	14	8	18
F3	26	24	16

Solve and optimize the solution by suitable method.

### **SECTION - II**

- Q7) a)** Discuss various costs involved in inventory control. [6]
- b)** A company plans to consume 700 pieces annually of a particular component. Past record indicate that its purchasing department spent Rs. 12,500 for placing 15000 purchase orders. The average inventory was valued at Rs. 50000 and the total storage cost was Rs. 7500, which included wages, rent, taxes, insurance, etc. related to storage department. The company borrows capital at 10% a year. If the cost of the component is Rs 12 and lot size is Rs 10, determine the [10]
- Purchase price/year
  - Purchase expenses/year
  - Storage expenses/year
  - Capital Cost/year
  - Total Cost/year

OR

- Q8) a)** Write a note on use of simulation techniques in queuing problems. [6]
- b)** A self service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time. find [10]
- Average number of customers in the system.
  - Average number of customers in the queue or average queue length.
  - Average time a customer spends in the system.
  - Average time a customer waits before being served.

- Q9) a)** Explain Average Accounting Rate of Return Method with its Merits and Demerits. [8]  
**b)** A manufacturing company produces a single product whose selling price is Rs. 16/unit and the variable cost is Rs. 12/unit. If annual fixed cost of the firm are estimated as Rs. 1,20,000. Find the break even point in units, in rupees and as a percentage of capacity if the firm has an estimated capacity of 50,000 units of the product. What is margin of safety? [8]

OR

- Q10) a)** Discuss the replacement policy for the items that fail suddenly. [6]  
**b)** A machine costs Rs 500. Operation and maintenance costs are zero for the first year and increases by Rs 100 every year. If money is worth 5% every year. determine the best age at which the machine should be replaced. The resale value of the machine is negligibly. What is the weighted average costs of owning and operating the machine? [10]

- Q11) a)** Discuss Floats. [6]  
**b)** Information on the activities required for a project is as follows. Find critical path, TF, FF, IF. [12]

Activity	1-2	1-3	1-4	2-5	3-5	3-6	3-7	4-6	5-7	6-8	7-8
NT	2	7	8	3	6	10	4	6	2	5	6

OR

- Q12) a)** Write difference between PERT and CPM. [6]  
**b)** A small project is composed of scrap activities whose time estimates are listed below. [12]

Activities		To	Tm	Tp
I	J			
1	2	3	6	15
1	6	2	5	14
2	3	6	12	30
2	4	2	5	8
3	5	5	11	17
4	6	3	6	15
6	7	3	9	27
5	8	1	4	7
7	8	4	19	28

- i) Draw network diagram  
 ii) Calculate the length and variance of the critical path,  
 iii) What is the approximate probability that the job on critical path will be completed in 41 days?

