

Student's Roll No. : .....  
(To be written before any answer)

Subject Code : OPER

**SEMESTER III – B.B.A. EXAMINATION 2008  
OPERATIONS RESEARCH**

*Full Marks : 50*

*Time : 2HRS.*

*Students should answer in their own words as far as practicable.*

**GROUP A**

Answer any FIVE questions :

[5x2=10]

- 1a. Obtain the dual of :  
Minimize  $z = cx$   
Subject to  $Ax \geq b, x \geq 0$
- b. Define Network.
- c. What is a Saddle point in Game theory?
- d. What is a Replacement Problem?
- e. What is the difference between Transportation problem and Assignment Problem?
- f. What do you mean by PERT?
- g. What is 'Traffic intensity' in Queuing theory?

**GROUP B**

Answer any FOUR questions :

- 1a. Write the dual of the following: L.P.P.

[5]

$$\text{Minimize } z = 2x_2 + 5x_3$$

Subject to

$$\begin{aligned}x_1 + x_2 &\geq 2 \\2x_1 + x_2 + 6x_3 &\leq 6 \\x_1 - x_2 + 3x_3 &= 4 \\x_1, x_2, x_3 &\geq 0\end{aligned}$$

- b. Solve the assignment problem : [5]

$$\begin{array}{l} I \\ II \\ III \\ IV \end{array} \begin{bmatrix} A & B & C & D \\ 1 & 4 & 6 & 3 \\ 9 & 7 & 10 & 9 \\ 4 & 5 & 11 & 7 \\ 8 & 7 & 8 & 5 \end{bmatrix}$$

- 2a. In a public telephone booth the arrivals are on the average 15 per hour. A call on the average takes 3 minutes. If there is just one phone, find the expected number of callers in the booth at any time. [5]

- b. Solve the following game and determine the value of the game [5]

$$A \begin{array}{c} B \\ \begin{bmatrix} 4 & -4 \\ -4 & 4 \end{bmatrix} \end{array}$$

- 3a. Solve the following LPP graphically :

Maximize  $z = 6x_1 + 5x_2$

Subject to :

$$3x_1 + x_2 \leq 160$$

$$x_1 \leq 40$$

$$x_2 \leq 130$$

$$x_1 \geq 80$$

$$x_1, x_2 \geq 0$$

[5]

- b. Solve the following transportation problem :

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	a <sub>i</sub>
O <sub>1</sub>	10	7	3	6	3
O <sub>2</sub>	1	6	8	3	5
O <sub>3</sub>	7	4	5	3	7
b <sub>j</sub>	3	2	6	4	

[5]

- 4a. An electrical appliance manufacturer wishes to know what the economic quantity should be for plastic impellers when the following information is available :

The average daily requirement is 120 units and the company has 250 working days a year so that the total yearly requirement is approximately 30,000 units. The manufacturing cost is 50 paise per unit. The sum of the annual rates for interest, insurance, taxes etc. is 20% of the unit cost and the cost of preparation is Rs. 50 per lot. [5]

- b. Find the saddle points of the following matrix. [5]

$$\text{Player A} \begin{matrix} & \text{Player B} \\ \begin{pmatrix} 4 & 2 & 3 & 5 \\ -2 & -1 & 4 & -3 \\ 5 & 2 & 3 & 3 \\ 4 & 0 & 0 & 1 \end{pmatrix} \end{matrix}$$

- 5a. A project schedule has the following characteristics :

Activity : 1-2 1-3 2-4 3-4 3-5 4-9 5-6 5-7

Time : 4 1 1 1 6 5 4 8  
(in dys)

Activity : 6-8 7-8 8-10 9-10

Time : 1 2 5 7  
(in dys)

Construct the network. [5]

- b. The annual demand of an item is 3200 units. The unit cost is Rs. 6 and inventory carrying charges 25% per annum. If the cost of one procurement is Rs. 150, determine EOQ. [5]

- 6a. The ABC Company wishes to schedule the production of a kitchen appliance that requires two resources – labour and materials. The company is considering three different models and its production engineering department has furnished the following data :

	MODEL		
	A	B	C
Labour (hours per unit)	7	3	6
Material (tbs per unit)	4	4	5
Profit (\$ per unit)	4	2	3

The supply of raw materials is restricted to 200 tbs per day. The daily availability of labour is 150 hours. Formulate a linear programming model to determine the daily production rate of the various models in order to maximize the fatal profit.

[5]

6b. A cafeteria with self service has an arrival rate of 12 persons per hour. The average time taken by a person to collect and consume his food is 20 minutes. Assuming that the inter-arrival times are exponentially distributed, how many seats must the cafeteria have to accommodate each customer with 95% probability?

[5]

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