Unit III

5. In a railway marshalling yard, good trains arrive at a rate of 30 trains per day.

Assuming that the enter arrival time follows an exponential distribution and the service time distribution is also exponential with an average at 36 minutes. Calculate :

(a) Expected queue size

(b) Probability that the queue size exceeds 10.

If the input of trains increases to an average of 33 per day, what will be the change in A and B ? **20**

6. The production department of a company requires 3600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25% of the investment in the inventories. The price is Rs. 10 per kg. Help the purchase manager to determine an ordering policy of raw material. **20**

No. of Printed Pages : 5 **Roll No. ....**

DD318

M. Sc. EXAMINATION, May 2019

(Fourth Semester)

(B. Scheme) (Main & Re-appear)

MATHEMATICS

MAT618B

Operation Research

Time : 3 Hours] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : The question paper will consists of four Units. Each Unit will contain *two* questions. The student should attempt a total *five* questions, by selecting at least *one* question from each Unit.

Unit I

1. Use the Simplex method to solve the following linear programming problem : **20**

Maximize :

$$z = 3x_1 + 5x_2 + 4x_3$$

Subject to the constraints :

$$2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_2 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

and $x_1, x_2, x_3 \geq 0$

2. Use Simplex method to solve the linear programming problem : **20**

Maximize :

$$z = 3x_1 + 5x_2$$

Subject to the constraints :

$$3x_1 + 2x_2 \leq 18$$

$$x_1 \leq 4, x_2 \leq 6$$

and $x_1, x_2 \geq 0$

Discuss the change in C_J on the optimality of the optimal basic feasible solution.

Unit II

3. A manufacturer has distribution centres at Agra, Allahabad and Kolkata. These centres have availability of 40, 20 and 40 units of his product, respectively. His retail outlets at A, B, C, D and E require 25, 10, 20, 30 and 15 units of the products, respectively. The transport cost (in figures) per unit between each centre outlet is given below : **20**

Distribution Centre	Retail Outlets				
	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Kolkata	40	60	95	35	30

Determine the optimal distribution so as to minimize the cost of Transportation.

4. Write the algorithm of Hungarian method for solving Assignment problem. **20**

Unit IV

7. Solve the following integer linear programming problem using Gomory's cutting plane method :

Maximize : **20**

$$z = x_1 + x_2$$

Subject to the constraints :

$$3x_1 + 2x_2 \leq 5$$

$x_2 \leq 2$ and $x_1, x_2 \geq 0$ and are integers.

8. Determine x_1 and x_2 so as to : **20**

Maximize :

$$z = 12x_1 + 21x_2 + 2x_1.x_2 - 2x_1^2 - 2x_2^2$$

Subject to the constraints :

$$x_2 \leq 8$$

$$x_1 + x_2 \leq 10$$

and $x_1, x_2 \geq 0$

Unit IV

7. Solve the following integer linear programming problem using Gomory's cutting plane method :

Maximize : **20**

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Subject to the constraints :

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$x_2 \leq 2$ and $x_1, x_2 \geq 0$ and are integers.

8. Determine x_1 and x_2 so as to : **20**

Maximize :

$$z = 12x_1 + 21x_2 + 2x_1.x_2 - 2x_1^2 - 2x_2^2$$

Subject to the constraints :

$$x_2 \leq 8$$

$$x_1 + x_2 \leq 10$$

and $x_1, x_2 \geq 0$