

Roll No.

94064

**B. Sc. (Hons.) Mathematics 5th
Semester Examination – March, 2021**

OPERATIONS RESEARCH

Paper : BHM-356

Time : Three Hours] [Maximum Marks : 60

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

Note : Attempt five questions in all, selecting *one* question from each Section. Question No. 9 is *compulsory*. All questions carry equal marks.

SECTION - I

1. (a) State three properties and three advantages of OR Models
- (b) PQR Feed company markets two mixes for cattle. The first mix Fertilex, requires at least twice as much Wheat as barley. The second mix, Multiplex, requires at least twice as much barley as wheat. Wheat costs Rs 1.50 per kg and 1000 kg

are available this month. Barley costs Rs. 1.25 per kg and 1200 kg are available. Fertilex sells for Rs. 1.80 per kg upto 99 kg and each additional kg over 99 sells for Rs. 1.65. Multiplex sells at Rs. 1.70 per kg upto 99 kg and each additional kg over 99 sells for Rs. 1.55. Bharat farms will buy any and all amounts of both mixes of PQR Feed company. Formulate mathematical model for the problem.

2. (a) What are the essential characteristics of a linear programming model.

- (b) Solve the LPP using Graphical Method :

$$\text{Max } Z = -x_1 + 2x_2$$

$$\text{Subject to } x_1 - x_2 \leq -1; -0.5x_1 + x_2 \leq 2; x_1, x_2 \geq 0$$

SECTION - II

3. (a) Explain simplex method of solving linear programming problem.

- (b) Use Big M method to solve :

$$\text{Maximize } z = x_1 + 2x_2 + 3x_3 - x_4$$

$$\text{s. t. c. } x_1 + 2x_2 + 3x_3 = 15; 2x_1 + x_2 + 5x_3 = 20;$$

$$x_1 + 2x_2 + x_3 + x_4 = 10; x_1, x_2, x_3, x_4 \geq 0$$

4. (a) Solve using two phase method :

$$\text{Maximize } z = 5x - 2y + 3z$$

$$\text{Subject to } 2x + 2y - z \geq 2; 3x - 4y \leq 3,$$

$$y + 3z \leq 5 \text{ where } x, y, z \geq 0$$

(b) Write the steps involved in two phase simplex method.

SECTION - III

5. (a) Using duality solve the problem :

$$\text{Minimize } z = x_1 - x_2$$

$$\text{Subject to } 2x_1 - x_2 \geq 2; -x_1 + x_2 \geq 1; x_1, x_2 \geq 0$$

(b) Explain steps involved in VAM.

6. Solve the transportation problem :

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	

SECTION - IV

7. Solve the assignment problem :

	A	B	C	D	E
M ₁	4	6	10	5	6
M ₂	7	4	-	5	4
M ₃	-	6	9	6	2
M ₄	9	3	7	2	3

8. (a) Describe the role of theory of games for scientific decision-making.

(b) Determine the saddle point and optimum strategies for each player.

	y		
x	4	6	4
	2	10	0

SECTION - V

9. (a) Explain the role of surplus variables

(b) Explain the terms : Saddle point and dominance

(c) Explain balanced assignment problem.

(d) What is the significance of dual variables.

(e) Write briefly on unbounded LPP.

(f) Explain North-West corner Method.