U 1658

M. A. /M. Sc.
(Final) Examination, 2021

MATHEMATICS

Paper - I (Optional)
Operations Research

Time allowed : **Three Hours**

Maximum Marks : **100**

Note : Non-programmable scientific calculator is allowed in this paper.

This question paper contains ***three*** *sections as under :*

Section-A ***Max. Marks-10***

This Section contains 01 compulsory question comprising 10 parts, having 2 parts from each unit, short answer in 20 words for each part. All questions carry equal marks.

Section-B ***Max. Marks-50***

This Section contains 10 questions having 2 questions from each unit. Answer 5 questions (250 words each) selecting one question from each unit. All questions carry equal marks.

Section-C ***Max. Marks-40***

This Section contains 04 descriptive type questions (questions may have sub division) covering all units but not more than one question from each unit. Answer any two questions. (500 words each). All questions carry equal marks.

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SECTION - A

1 (i) Define LPP.

(ii) Write an example of primal and its and problem.

(iii) What is two person zero sum game?

(iv) Write the name of the method to solve an integer programming problem.

(v) Define PERT.

(vi) Write an example of deterministic model for dynamic programming.

(vii) What are the uses of frequency.

(viii) What are the uses of K.T. conditions.

(ix) Write an example of quadratic programming.

(x) Define Traffic Intensity.

SECTION - B

UNIT - I

2 Solve LPP

Max $z = 8x_1 + x_2$

St. $8x_1 + x_2 \le 8$

$2x_1 + x_2 \le 6$

$3x_1 + x_2 \le 6$

$x_1 + 6x_2 \le 8$

$x_1, x_2 \ge 0$

3 Given the LPP max $z = 3x_1 + 5x_2$

St. $x_1 \le 4$

$x_2 \le 6$

$3x_1 + 2x_2 \le 18$

$x_1, x_2 \ge 18$

Discuss the effect on optimality of the solution where object function is changed to $3x_1 + x_2$.

UNIT - II

4 Solve the following LPP by Gomory technique

Max $z = 3x_2$

St. $3x_1 + 2x_2 \le 7$

$-x_1 + x_2 \le 2$

$x_1, x_2 \ge 0$ and are integers

5 For what value of λ the game with the following ayoff matrix is strictly determinable.

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \end{array} \begin{array}{c} \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \begin{bmatrix} \lambda & 6 & 2 \\ -1 & \lambda & -7 \\ -2 & 1 & \lambda \end{bmatrix} \end{array}$$

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UNIT - III

6 Draw the following network using dummies wherever necessary.

Activity	A	B	C	D	E	F	G	H	I	J
Immediate	-	-	B	A, B	A, B	B	E, D, F	D, E	F, F	H, G, I, C

7 A ship to be loaded by 3 items. Each unit of item 'n' has a weight (W_n) and value (V_n). The maximum cargo weight the ship can take is 5 and the details of the 3 items are as follows:-

Item (n)	Weight (W_n)	Value (V_n)
1	3	7
2	3	10
3	1	3

Find the most valuable cargo load without exceeding the maximum cargo weight by using dynamic programming.

UNIT - IV

8 Given the following data find EOQ, optimum safety stock and recorder point

Annual consumption = 12000 unit @ 7.5/unit

Setup cost = 6.00

Holding cost = 0.12/unit/month

Normal load time = 15 days

Maximum load time = 20 days

9 Solve max $Z = 2x_1 + 3x_2 - 2x_2^2$

st. $x_1 + 4x_2 \le 4$

$x_1 + x_2 \le 2, x_1, x_2 \ge 0$

UNIT - V

10 Solve by Wolfe method

max $Z = 6 - 6x_1 + 2x_1^2 - 2x_1x_2 + 2x_2^2$

st. $x_1 + x_2 \le 2$

$x_1, x_2 \ge 0$

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11 Trains arrive at the yard every 15 minutes and service time is 33 min. If the line capacity of the yard is limited to 5 trains find the probability that the yard is empty and the average number of trains in the system.

SECTION - C

12 Solve the following mixed integer programming problem

Max $Z = 4x_1 + 6x_2 + 2x_3$

St. $4x_1 - 4x_2 \leq 5$

$-x_1 + 6x_2 \leq 5$

$-x_1 + x_2 + x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$ and x_1 & x_3 are Integers

13 Solve by dynamic programming techniques

Min $Z = x_1^2 + x_2^2 + x_3^2$

st. $x_1 + x_2 + x_3 \geq 15$

$x_1, x_2, x_3 \geq 0$

14 Determine the best cost schedule for the following using CPM :

Activity	Normal time (days)	Crash time (days)	Cost Slope (Rs. / day)
1-2	5	3	3
2-3	4	2	2
3-4	6	3	4
3-5	4	1	3
4-5	3	1	6

15 Solve following game by Linear Programming

$$A = \begin{array}{c} \\ x_1\ 1 \\ x_2\ 2 \\ x_3\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} y_1 & y_2 & y_3 \\ 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 4 & 1 & -3 \\ 3 & 1 & 6 \\ -3 & 4 & -2 \end{bmatrix} \end{array} B$$

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