# PG-20415

## TERM END EXAMINATION – 2020

## M. Sc. FINAL YEAR

## MATHEMATICS

## Operation Research

[Maximum Marks: **70**

***Note** : Time – According to University Timing.*

*All questions are compulsory. All questions carry equal marks.*

1. (a) Using Simplex method: [7

Max. $Z = 3x_1 + 2x_2 + 5x_3$.

Subject to the constraints:

$x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1 + 4x_2 \leq 420$ and $x_1, x_2, x_3 \geq 0$

**OR**

Discuss about. Phases or Methodology of operations research and classification of models.

(b) Construct the dual of following LPP: [7

Minimize $Z = x_1 + x_2 + x_3$

Subject to:

$x_1 + 2x_2 \geq 20$

$3x_1 + 2x_2 \geq 50$

Where $x_1$ and $x_2$ are non-negative integers.



**OR**

Apply the principle of duality to solve the LPP:

Max. $Z = 3x_1 - 2x_2$

Subject to

$x_1 + x_2 \leq 5$,

$x_1 \leq 4$, $1 \leq x_2 \leq 6$ and $x_1, x_2 \geq 0$.

2. Any two: **[2×7=14]**

(a) Solve the following transformation problem to maximize the profit:

| | Destinations | | | | |
|---|---|---|---|---|---|
| Sources | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
| $S_1$ | 15 | 51 | 42 | 33 | 23 |
| $S_2$ | 80 | 42 | 26 | 81 | 44 |
| $S_3$ | 90 | 40 | 66 | 60 | 33 |
| | 23 | 31 | 16 | 30 | |

(b) What is PERT and CPM? Also compare how they are different?

(c) Explain Transportation Problems and Assignment Problems in short. Also differentiate them.

3. Solve any two parts: **[2×7=14]**

(a) Solve the following LPP using dynamic programming-

Maximize $Z = 3x_1 + 4x_2$

Subject to

$2x_1 + x_2 \geq 40$

$2x_1 + 5x_2 \leq 180$

Where $x_1, x_2 \geq 0$



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(b) Solve the following game-

| | | Player B | |
|---|---|---|---|
| | | $B_1$ | $B_2$ |
| Player A | $A_1$ | 3 | 5 |
| | $A_2$ | 4 | 1 |

(c) By using dynamic programming, solve the following problem:

Minimize $u_1^2 + u_2^2 + u_3^2$

Subject to $u_1 + u_2 + u_3 = 10$

And $u_1, u_2, u_3 \geq 0$.

4. Solve any two: **[2×7=14]**

(a) Discuss simulation with terminology steps and advantages.

(b) Discuss advantages and limitations of integer programming.

(c) Solve the following integer programming problem by using branch and bound method:

Minimize $Z = 3x_1 + 2.5x_2$

Subject to

$x_1 + 2x_2 \geq 20$

$3x_1 + 2x_2 \geq 50$

Where integers, $x_1, x_2 \geq 0$

5. Solve any two: **[2×7=14]**

(a) Discuss the difference in between Linear programming problem and Non-linear programming problem.

(b) Explain about classification of non-linear programming problem.

(c) Find the extreme value of

$z = f(x_1, x_2) = 2x_1x_2$

Subject to: $x_1^2 + x_2^2 = 1$

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