| A–10173 |
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| Sub. Code |
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| 4BITSA2 |

**U.G. DEGREE EXAMINATION, APRIL 2021 &**

**Supplementary / Improvement / Arrear Examinations**

**Information Technology**

**Allied – OPERATION RESEARCH**

**(CBCS – 2014 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** $(10 \times 2 = 20)$

Answer **all** questions.

1. Define OR.

2. What is the Scope of OR?

3. Define Slack Variable.

4. What are the phases of the two-phase method of solving a LPP?

5. Write the dual of the LPP:

   Minimize $Z = 2x_1 - 3x_2$

   Subject to :

   $$x_1 + x_2 \geq 3$$
   $$2x_1 - 3x_2 \geq 1$$
   $$x_1, x_2 <= 0.$$

6. What is the use of Branch and Bound Method?

7. When do you say an assignment problem is balanced?

8. State the Travelling Salesman Problem.

9. What is degeneracy in a Transportation Problem?

10. State any two methods used to obtain the IBFS of a Transportation Problem.

**Part B** $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss the main phases of OR.

Or

(b) What is modeling? Explain in the context of OR.

12. (a) Obtain the graphical solution to the following LPP:

Maximize $z = 4x_1 + x_2$

Subject to

$$x_1 + x_2 \leq 50$$
$$3x_1 + x_2 \leq 90$$
$$x_1, x_2 \geq 0.$$

Or

(b) Write the steps for solving an LPP using the artificial variable technique.

13. (a) Use Dual Simplex method to solve the LPP:

Minimize $z = 2x_1 + 3x_2$

Subject to

$$2x_1 - x_2 - x_3 \geq 3$$
$$x_1 - x_2 + x_3 \geq 2$$
$$x_1, x_2, x_3 \geq 0.$$

Or

(b) Write the steps of the Branch and Bound Method.

14. (a) What are the methods to solve an assignment problem? Explain any one.

Or

(b) Solve the following Assignment problem:

| | J1 | J2 | J3 | J4 |
|---|---|---|---|---|
| W1 | 82 | 83 | 69 | 92 |
| W2 | 77 | 37 | 49 | 92 |
| W3 | 11 | 69 | 5 | 86 |
| W4 | 8 | 9 | 98 | 23 |

15. (a) What is an unbalanced transportation problem? Give an example.

Or

(b) Obtain the IBFS of the following Transportation Problem:

| Source/To | D | E | F | Supply |
|---|---|---|---|---|
| A | 5 | 8 | 4 | 50 |
| B | 6 | 6 | 3 | 40 |
| C | 3 | 9 | 6 | 60 |
| Demand | 20 | 95 | 35 | 150 |

**Part C** (3 × 10 = 30)

Answer any **three** questions.

16. Discuss the tools, techniques, and methods of OR.

17. Use the Big-M Method for the LPP:
Maximize $z = 3x_1 + 2x_2$
Subject to :

$$2x_1 + x_2 \leq 2$$
$$3x_1 + 4x_2 \geq 12$$
$$x_1, x_2 \geq 0.$$

18. Explain Gomory's cutting plane method with an example.

19. Use Hungarian method to solve the following Assignment Problem:

| | I | II | III | IV |
|---|---|---|---|---|
| A | 8 | 26 | 17 | 11 |
| B | 13 | 28 | 4 | 26 |
| C | 38 | 19 | 18 | 15 |
| D | 19 | 26 | 24 | 10 |

20. Obtain the optimal solution for the following Transportation Problem:

A trucking company has a contract to move 115 truckloads of sand per week between three sand washing plants W, X, and Y, and three destinations A, B, and C. Cost and volume information is given below. Compute the optimal transportation cost.

| To / From | Project A | Project B | Project C | Supply |
|---|---|---|---|---|
| Plant W | 5 | 10 | 10 | 35 |
| Plant X | 20 | 30 | 20 | 40 |
| Plant Y | 5 | 8 | 12 | 40 |
| Demand | 45 | 50 | 20 | |