***U.S.N*** | | | | | | | | | | |

# P.E.S. College of Engineering, Mandya - 571 401

***(An Autonomous Institution affiliated to VTU, Belagavi)***

**Eighth Semester, B.E. - Mechanical Engineering**

**Semester End Examination; May/June - 2018**

**Operations Research**

*Time: 3 hrs* *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

**UNIT - I**

1 a. Explain scope of OR. 8

b. A truck company requires the following number of drivers for its trucks during 24 hours : 12

| Time | No. of Required |
|---|---|
| 0 - 4 hr | 5 |
| 4 - 8 hr | 10 |
| 8 - 12 hr | 20 |
| 12 - 16 hr | 12 |
| 16 - 20 hr | 22 |
| 20 - 24 hr | 8 |

According to shift schedule a driver may join to duty at midnight 4, 8, 12, 16 and 20 hrs and work continuously for 8 hrs. Formulate the problem as L.P Problem.

2 a. Explain the following terms with respect to LPP : 8

i) Alternate optimal solutions ii) Unbounded solutions

iii) Infeasible solutions iv) Redundant constraint

b. Solve graphically, 12

Maximize $Z = 2x_1+x_2$

Subject to $x_1 + 2x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

$x_1 - 2x_2 \leq 1$ and $x_1, x_2 \geq 0$

**UNIT - II**

3. Use two-phase simplex method to solve the following LPP : 20

Maximize $Z = 3x_1 + 2x_2 + 2x_3$

Subject to $5x_1 + 7x_2 + 4x_3 \leq 7$

$-4x_1 + 7x_2 + 5x_3 \geq -2$

$3x_1 + 4x_2 + 5x_3 \geq 29/7$

$x_1, x_2, x_3 \geq 0$

4. Solve by simplex method the following LPP : 20

Minimize $Z = x_1 - 3x_2 + 3x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 + 4x_2 \geq -12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$

Contd…2

## UNIT - III

5. Determine the optimized solution to the following transportation problem : 20

| | | Stores | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | Supply |
| Warehouses | 1 | 9 | 12 | 9 | 6 | 9 | 10 | 5 |
| | 2 | 7 | 3 | 7 | 7 | 5 | 5 | 6 |
| | 3 | 6 | 5 | 9 | 11 | 3 | 11 | 2 |
| | 4 | 6 | 8 | 11 | 2 | 2 | 10 | 9 |
| Demand | | 4 | 4 | 6 | 2 | 4 | 2 | |

6. Solve the following transportation and check for optimality, 20

| | $W_1$ | $W_2$ | $W_3$ | $W_4$ | $W_5$ | Available |
|---|---|---|---|---|---|---|
| $F_1$ | 7 | 6 | 4 | 5 | 9 | 40 |
| $F_2$ | 8 | 5 | 6 | 7 | 8 | 30 |
| $F_3$ | 6 | 8 | 9 | 6 | 5 | 20 |
| $F_4$ | 5 | 7 | 7 | 8 | 6 | 10 |
| Required | 30 | 30 | 15 | 20 | 5 | |

## UNIT - IV

7. Solve the following assignment problem to get optimal allocation; 20

| | I | II | III | IV | V |
|---|---|---|---|---|---|
| 1 | 10 | 5 | 9 | 18 | 11 |
| 2 | 13 | 9 | 6 | 12 | 14 |
| 3 | 3 | 2 | 4 | 4 | 5 |
| 4 | 18 | 9 | 12 | 17 | 15 |
| 5 | 11 | 6 | 14 | 19 | 10 |

8. Find the optimal solution to following assignment problem : 20

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| A | 12 | 10 | 15 | 22 | 18 | 8 |
| B | 10 | 18 | 25 | 15 | 16 | 12 |
| C | 11 | 10 | 3 | 8 | 5 | 9 |
| D | 6 | 14 | 10 | 13 | 13 | 12 |
| E | 8 | 12 | 11 | 7 | 13 | 10 |

## UNIT - V

9. Solve the game given below by graphical method : 20

| | | Player B | | | |
|---|---|---|---|---|---|
| | | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ |
| Player A | $X_1$ | 19 | 6 | 7 | 5 |
| | $X_2$ | 7 | 3 | 14 | 6 |
| | $X_3$ | 12 | 8 | 18 | 4 |
| | $X_4$ | 8 | 7 | 13 | -1 |

10. Solve the following 2 x 5 game by graphical method : 20

| | | Player B | | | | |
|---|---|---|---|---|---|---|
| | | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ | $Y_5$ |
| Player A | $X_1$ | -5 | 5 | 0 | -1 | 8 |
| | $X_2$ | 8 | -4 | -1 | 6 | -5 |

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