

Sixth Semester B.E. Degree Examination, June/July 2024
Operations Research

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1
 - a. Define operations research. Explain the phases of operations research. (08 Marks)
 - b. A firm can be produced 3 types of body sweaters say A, B and C. Three kinds of wool are required for it, say red wool, green wool and blue wool. One unit of type A sweater needs 2 yards of red wool and 3 yards of blue wool, one unit of type B sweater needs 3 yards red wool 2 yards of green wool and 2 yards of blue wool. One unit of type C sweater needs 5 yards of green wool and 4 yards of blue wool. The firm has only a stock of 80 yards of red wool, 100 yards of green wool and 150 yards of blue wool. It is assumed that the income obtained from each unit of type A sweater is Rs. 30, type B sweater is Rs. 50 and type C sweater is Rs. 40. Formulate this problem as LPP. (05 Marks)
 - c. Using graphical method solve the following :
 Maximize $Z = 3000x_1 + 2000x_2$
 Subject to $x_1 + 2x_2 \leq 6$
 $2x_1 + x_2 \leq 8$
 $x_2 \leq 2$
 $-x_1 + x_2 \leq 1$
 and $x_1, x_2 \geq 0$. (07 Marks)
- 2
 - a. Explain the steps needed to find feasible solution using Simplex method. (08 Marks)
 - b. Work through the Simplex method to solve the following problem :
 Maximize $z = -x_1 + 4x_2$
 Subject to $-3x_1 + x_2 \leq 6$
 $x_1 + 2x_2 \leq 4$
 $x_3 \geq -3$. (12 Marks)
- 3
 - a. Explain two phase technique to solve LPP in simplex method. (06 Marks)
 - b. Use Big-M method to solve the following LPP
 Maximize $Z = 2x_1 + x_2$
 Subject to $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 3$ (14 Marks)
- 4
 - a. Explain the computational procedure of revised Simplex method in standard form. (08 Marks)
 - b. Using revised Simplex method solve the following LPP :
 Minimize $Z = x_1 + x_2$
 Subject to $x_1 + 2x_2 \geq 7$
 $4x_1 + x_2 \geq 6$
 and $x_1, x_2 \geq 0$. (12 Marks)

PART – B

- 5 a. Solve the following problem by dual Simplex method :

Minimize $z = -x_1 - 3x_2$
 Subject to $x_1 - 2x_2 \leq 2$
 $-x_1 + x_2 \leq 4$
 and $x_1 \geq 0,$
 $x_2 \geq 0.$

(13 Marks)

- b. Explain the role and essence of sensitivity analysis.

(07 Marks)

- 6 a. Write different steps in Hungarian Algorithm to solve an assignment problem. (08 Marks)
 b. Obtain optimal solution of transportation problem using the data given below. Use Vogel's approximation method to obtain an initial basic feasible solution. (12 Marks)

| | D ₁ | D ₂ | D ₃ | D ₄ | Supply |
|----------------|----------------|----------------|----------------|----------------|--------|
| S ₁ | 19 | 30 | 50 | 10 | 7 |
| S ₂ | 70 | 30 | 40 | 60 | 9 |
| S ₃ | 40 | 8 | 70 | 20 | 18 |
| Demand | 5 | 8 | 7 | 14 | 34 |

- 7 a. Using the dominance concept, obtain the optimal strategies for both the players and determine the value of game. The pay off matrix for player A is given. (10 Marks)

| | | B | | | | |
|---|-----|---|----|-----|----|---|
| | | I | II | III | IV | V |
| A | I | 2 | 4 | 3 | 8 | 4 |
| | II | 5 | 6 | 3 | 7 | 8 |
| | III | 6 | 7 | 9 | 8 | 7 |
| | IV | 4 | 2 | 8 | 4 | 3 |

- b. Using Graphical method solve the following :

(10 Marks)

| | | B | | |
|---|----|---|----|-----|
| | | I | II | III |
| A | I | 1 | 3 | 11 |
| | II | 8 | 5 | 2 |

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- 8 a. Discuss the sub-Tour reversal algorithm with an example. (07 Marks)
 b. Consider the minimum spanning tree problem and
 Constraints 1 : Link AD can be included only if link DE also is included
 Constraints 2 : At most one of the 3 links AD, CD and AB can be included.
 Starting with the initial trial solution where the inserted links are AB, AC, AD and CE and apply tabu search algorithm to find the feasible solution. (09 Marks)

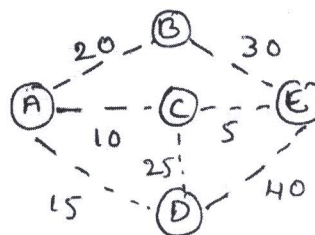


Fig.Q8(b)

- c. Explain the genetic algorithm.

(04 Marks)
