Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 07

M.Sc (Mathematics E-I) (2017 Batch) (Sem.–3)

OPERATIONS RESEARCH

Subject Code : MSM-502

Paper ID : [75386]

Time : 3 Hrs. Max. Marks : 80

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of EIGHT questions carrying TWO marks each.**
2. **SECTION - B & C. have THREE questions in each section carrying SIXTEEN marks each.**
3. **Select atleast TWO questions from SECTION - B & C EACH.**

SECTION-A

1. (a) Write major steps in the solution of a LPP by graphical method.

   (b) What do we mean by objective function?

   (c) Discuss limitations of linear programming problem.

   (d) Explain the concept of sensitivity analysis.

   (e) What is a balanced transportation problem?

   (f) Explain the nature of travelling salesman problem.

   (g) Write Kuhn Tucker conditions for constrained optimization.

   (h) Explain, in brief, gradient based methods for multivariable optimization.

SECTION-B

2. (a) Solve the following LP problems graphically Maximize $Z = 300x + 400y$ subject to the constraints $5x + 2y \leq 180$, $3x + 3y \leq 135$, $x, y \geq 0$.

   (b) Use Simplex method to : Maximize $Z = 6x + 7y$, subject to the constraints $7x + 6y \leq 42$, $5x + 9y \leq 45$, $x - y \leq 4$, $x, y \geq 0$.

3. Solve the following LPP by Big M method

   Maximize $Z = 3x_1 + 2x_2 + 5x_3$ subject to the constraints

   $x_1 + 2x_2 + x_3 \leq 430$, $3x_1 + 2x_3 \leq 460$, $x_1 + 4x_2 \leq 420$, $x_1, x_2, x_3 \geq 0$.

4. Explain the concept of duality in linear programming. Solve by dual Simplex method Minimize $Z = 10x_1 + 6x_2 + 2x_3$ subject to the constraints

   $-x_1 + x_2 + x_3 \geq 1$, $3x_1 + x_2 - x_3 \geq 2$, $x_1, x_2, x_3 \geq 0$.

SECTION-C

5. (a) Solve the following transportation problem :

Source	Destination				Availability
	D1	D2	D3	D4	
01	21	16	25	13	11
02	17	18	14	23	13
03	32	27	18	41	19
Requirement	6	10	12	15	43

(b) Solve the following assignment problem to find the maximum total expected sale.

	Area	I	II	III	IV
Salesman	A	42	35	28	21
	B	30	25	20	15
	C	30	25	20	15
	D	24	20	16	12

6. Discuss applications of PERT/CPM techniques.

A project has the following time schedule :

Activity	Time in week	Activity	Time in week
1-2	4	5-7	8
1-3	1	6-8	1
2-4	1	7-8	2
3-4	1	8-9	1
3-5	6	8-10	8
4-9	5	9-10	7
5-6	4		

Construct PERT network and compute critical path and its duration.

7. (a) Using Kuhn Tucker conditions Minimize $(x-1)^2 + (y-5)^2$ subject to the constraints $-x^2 + y \leq 4, -(x-2)^2 + y \leq 3$.

(b) Using successive quadratic estimation method find the minimum of the single variable function $f(x) = x^2 + 54/x$.