2/4/2016

DOON UNIVERSITY, DEHRADUN

Mid Semester Examination, Fourth Semester, 2015-16

School of Technology

Class: Integrated M.C.A. **Course: Operational Research**

Course Code: STM-525

Time Allowed: 2Hours *Maximum Marks: 30*

Note: **Attempt all four questions in Section A.Each question carries 1.5 marks.**
Attempt any three questions in Section B. Each question carries 4 marks.
Attempt any two questions in Section C. Each question carries 6 marks.

SECTION: A
(Very Short Answer Type Questions)

(Marks:4X1.5=6)

1. Define the following terms
   (i) Simplex
   (ii) Basic feasible solution
   (iii) Hyperplane
2. Use graphical method to solve the problem:

   Maximize $Z = 5x_1 + 3x_2$

   Subjected to: $4x_1 + 5x_2 \leq 10$

   $5x_1 + 2x_2 \leq 10$

   $3x_1 + 8x_2 \leq 12$

   $x_1, x_2 \geq 0$
3. Write the dual of the linear programming problem

   Minimize $Z = 2x_1 + 3x_2 + 4x_3$

   Subjected to :

   $2x_1 + 2x_2 + 3x_3 \leq 4$

   $3x_1 + 4x_2 + 5x_3 \geq 5$

   $x_1 + x_2 + x_3 = 7$

   $x_1, x_2, x_3 \geq 0.$
4. Prove that the dual of the dual is primal.

SECTION: B
(Short Answer Type Questions)

(Marks: 3X4=12)

1. Show that $S = \{(x_1, x_2, x_3): x_1^2 + x_2^2 + x_3^3 \leq 1\} \subset R^3$ is a convex set.
2. Use Simplex method to solve the following LPP:

   Minimize $Z = 5x_1 + 3x_2$

   Subjected to: $4x_1 + 5x_2 \leq 10$

   $5x_1 + 2x_2 \leq 10$

   $3x_1 + 8x_2 \leq 12$

   $x_1, x_2 \geq 0$

3. Use Dual-simplex method to solve the following LPP:

$$\text{Minimize} \quad Z = -x_1 - 4x_2 + 3x_3$$
$$\text{Subjected to:} \quad 2x_1 + x_2 - 6x_3 = 20$$
$$6x_1 + 5x_2 + 10x_3 \leq 76$$
$$8x_1 - 3x_2 + 6x_3 \leq 50$$
$$x_1, x_2, x_3 \geq 0$$

4. Solve the following minimal assignment problem:

		Man 1	2	3	4
	I	12	30	21	15
	II	18	33	9	31
Job	III	44	25	24	21
	IV	23	30	28	14

SECTION: C
(Long Answer Type Questions)

(Marks: 2X6=12)

1. (a) Solve the following L.P.P. using Big-M method. (4+2)

$$\text{Minimize} \quad Z = 2x_1 + x_2$$
$$\text{Subjected to:} \quad 3x_1 + x_2 = 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 3$$
$$x_1, x_2 \geq 0$$

(b) Discuss the effect on the optimal solution of question 1(a) when the vector b is changed from $(3,6,3)^T$ to $(5,5,3)^T$.

2. Solve the following L.P.P. using Two-Phase method

$$\text{Maximize} \quad Z = 4x_1 + x_2$$
$$\text{Subjected to:} 2x_1 + x_2 \leq 6$$
$$x_1 + 2x_2 \leq 5$$
$$x_1 + x_2 \geq 1$$
$$x_1 + 4x_2 \geq 2$$
$$x_1, x_2 \geq 0$$

3. Solve the following transportation problem to maximize profit

Origin	Profit(Rs.)/Unit Destination 1	2	3	4	Supply
A	40	25	22	33	100
B	44	35	30	30	30
C	38	38	28	30	70
Demand	40	20	60	30	