KJ-567

M.Sc. (Mathematics)

3rd Semester Examination, June, 2020

Optional (A)

Paper - IV

Operations Research - I

Time : Three Hours] [*Maximum Marks* : 80

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (*a*) Solve the following problem using Simplex method :

Maximize $z = 4x_1 + 10x_2$

Subject to

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

and $x_1, x_2 \geq 0$

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(*b*) Solve the following LPP using Simplex method :

Maximize $z = 2x_1 - x_2 + x_3$

Subject to

$3x_1 + x_2 + x_3 \leq 60$

$x_1 - x_2 + 2x_3 \leq 10$

$x_1 + x_2 - x_3 \leq 20$

and $x_1,\ x_2,\ x_3 \geq 0$

(*c*) Explain the algorithm of Simplex method.

Unit-II

2. (*a*) Prove that the dual of the dual is primal.

(*b*) Write the dual of the following LPP :

Maximize $z = 3x_1 - 2x_2 + 4x_3$

Subject to

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

$6x_1 + x_2 + 3x_3 \geq 4$

$7x_1 - 2x_2 - x_3 \leq 10$

$x_1 - 2x_2 + 5x_3 \geq 3$

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

and $x_1,\ x_2,\ x_3 \geq 0$

(*c*) Use the principle of duality to solve the following LPP :

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 $x_1 \geq 0,\ x_2 \geq 0$

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Unit-III

3. (*a*) Explain interior point algorithm.

(*b*) Obtain the variation is C_j (j = 1, 2) which are permitted without changing the optimal solution :

Maximize $z = 3x_1 + 5x_2$

Subject to

$$x_1 + x_2 \leq 1$$
$$2x_1 + 3x_2 \leq 1$$

and $x_1 , x_2 \geq 0$

(*c*) Solve the following parametric linear programming :

Maximize $z = (\lambda - 1)x_1 + x_2$

Subject to

$$x_1 + 2x_2 \leq 10$$
$$2x_1 + x_2 \leq 11$$
$$x_1 - 2x_2 \leq 3$$

and $x_1 , x_2 \geq 0$

Unit-IV

4. (*a*) Solve the following Transportation Problem :

	x	*y*	*z*	*t*	Requirements
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Capacity	200	225	275	250	

(*b*) Explain Vogel's approximation method.

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(*c*) Consider the problem of assigning five jobs to five persons. The assignment cost are given as follows :

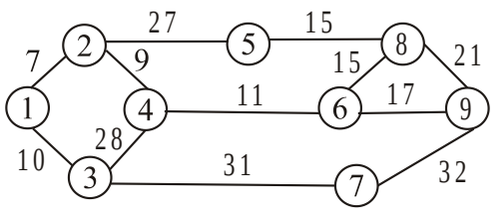
	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

Determine optimum assignment schedule.

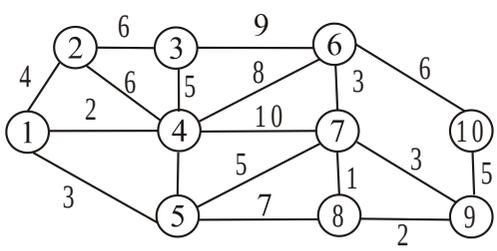
Unit-V

5. (*a*) Distinguish between PERT and CPM.

(*b*) Find the shortest path from 1 to 9 of the distance network shown below :



(*c*) Find the minimum spanning tree of the following distance matrix :



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