LJ-567

M.Sc. Mathematics

3rd Semester Examination, July-Dec., 2020

Optional (A)

Paper - IV

Operations Research

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

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

Unit-I

1. (*a*) Use two-phase simplex method to solve the following L.P.P.

Minimize $z = x_1 + x_2$

Subject to the constraints :

$$2x_1 + x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

$$x_1,\ x_2 \geq 0$$

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(*b*) Use penalty method to solve the following L.P.P.

Maximize $z = 6x_1 + 4x_2$

Subject to the constraints :

$2x_1 + 3x_2 \leq 30$

$3x_1 + 2x_2 \leq 24$

$x_1 + x_2 \geq 3$

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

(*c*) Apply the principle of duality to solve the following L.P.P.

Maximize $z = 3x_1 + 2x_2$

Subject to the constraints :

$x_1 + x_2 \geq 1$

$x_1 + x_2 \leq 7$

$x_1 + 2x_2 \leq 10$

$x_2 \leq 3$

$x_1,\ x_2 \geq 0$

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Unit-II

2. (*a*) State the fundamental theorem of duality and explain the Dual simplex method.

(*b*) Use dual simplex method to solve the following L.P.P.

Minimize $z = x_1 + x_2$

Subject to the constraints :

$$2x_1 + x_2 \geq 2$$

$$-x_1 - x_2 \geq 1$$

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

(*c*) Use dual simplex method to solve the following L.P.P.

Minimize $z = 10x_1 + 6x_2 + 2x_3$

Subject to the constraints :

$$-x_1 + x_2 + x_3 \geq 1$$

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

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

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Unit-III

3. (*a*) What is goal programming ? Clearly state its assumptions.

(*b*) Use the bounded variable technique to solve the following L.P.P.

Maximize $z = x_2 + 3x_3$

Subject to the constraints :

$$x_1 + x_2 + x_3 \leq 10$$

$$x_1 - 2x_3 \geq 0$$

$$2x_2 - x_3 \leq 10$$

$$0 \leq x_1 \leq 8$$

$$0 \leq x_2 \leq 4$$

$$x_3 \geq 0$$

(*c*) Write a short note on parametric linear programming.

Unit-IV

4. (*a*) Explain briefly the following :

(*i*) North-West corner rule

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(*ii*) Vogel's approximation method for finding an initial basic feasible solution for a transportation problem.

(*b*) Solve the following Transportation problem :

	Destination				
Origin	D_1	D_2	D_3	D_4	Availability
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
Requirement	20	40	30	10	

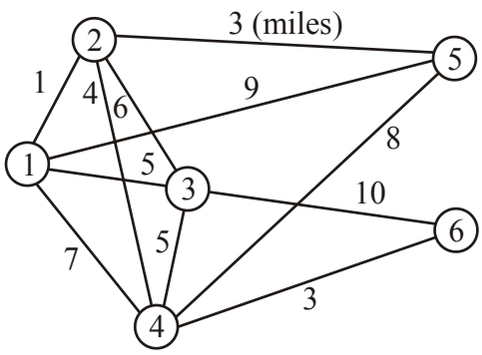
(*c*) Solve the following assignment problem :

	E	*F*	*G*	*H*
A	10	12	19	11
B	5	10	07	08
C	12	14	13	11
D	08	15	11	9

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Unit-V

5. (*a*) The Midwest TV cable company is in the process of providing cable services to five new housing development areas. The figure below depicts the potential TV linkages among the five areas. The cable miles are shown on each branch.



Determine the most economical cable network for the Midwest company.

(*b*) Briefly describe the augmenting path algorithm to solve a maximal flow problem.

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(*c*) Distinguish between PERT and CPM. What is a critical path ?

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