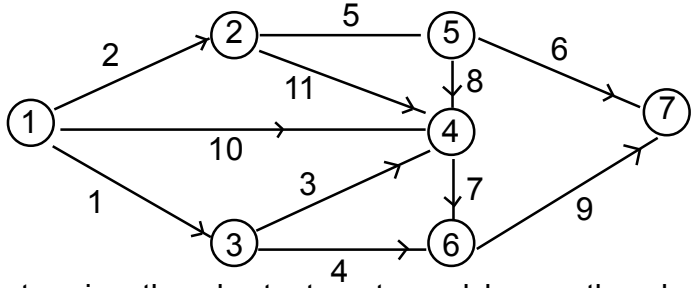
Work out the optimal assignment and the total minimum time taken.

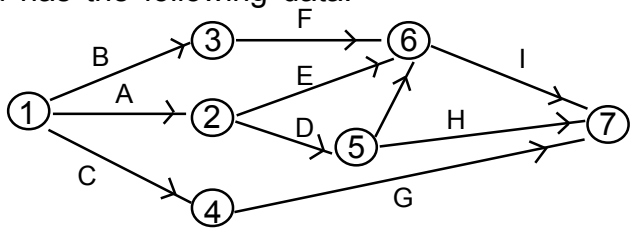
Q.12 The network below gives the permissible routes and their lengths in miles between station of city I (node 1) and six other cities (nodes 2 - 7)



Determine the shortest route and hence the shortest distance from city 1 to city 7.

OR

A project is represented by the network shown below and has the following data.



Task.	A	B	C	D	E	F	G	H	I
optimistic time	5	18	26	16	15	6	7	7	3
pessimistic time	10	22	40	20	25	12	12	9	5
Most likely time	8	20	33	18	20	9	10	8	4

Determine the following.

1) Expected task time and their variance.
2) The earliest & latest expected times to reach each event.
3) Critical path and
4) Probability of an event occuring at proposed completion date if original contact time of competing the project is 41.5 week. (Given that P/Z > 0.52) = .70)

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Roll No. .....

W - 3204

Third Semester Examination 2021

M.Sc. (Mathematics)

Operation Research (I)

Paper - IV

Time :- 3 Hrs. M.M. 80

SECTION - A (4x3=12)

Very short answer type questions.(maximum 3 lines)

Q.1 Define with example slack, surplus and artificial variable in L.P.P ?

Q.2 What is unbounded assignment problem ?

Q.3 Define bounded variable technique in L.P.P. ?

Q.4 What is network flow problem ? illustrate with example?

SECTION - B

Short answer type questions with maximum word limit 150. (4x5=20)

Q.5 Discuss significance and scope of operation research in decision making problems ?

OR

Explain briefly the application of operation research ?

Q.6 State the fundamental theorem of duality and express general rules for forming a dual L.P.P from its dual ?

OR

Write short note on Parametric linear programming problem ?

Q.7 Find initial B.F.S of following transportation problem by vogel's method

Ware houses

Factories	W_1	W_2	W_3	W_4	W_5	Availability
F_1	20	28	32	55	70	50
F_2	48	36	40	44	25	100
F_3	35	55	22	45	48	150
Requirement	100	70	50	40	40	

OR

Show that assignment problem is special case of transportation Problem ?

Q.8 Distinguish between PERT and CPM ? What is Critical Path ?

OR

Define slack time, total float, free float independent float, activity variance, project variance in context of network model ?

SECTION - C

Long answer type questions with maximum word limit 500. (4x12=48)

Q.9 Use two-phase method to solve L.P.P.

Maximize $Z = x_1 + 2x_2 + 3x_3$

Subject to constraints.

$$x_1 - x_2 + x_3 > 4$$
$$x_1 + x_2 + 2x_3 < 8$$
$$x_1 - x_3 > 2$$
$$x_1 > 0, x_2 > 0, x_3 > 0$$

OR

Use Big M. Method to solve L.P.P.

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

Subject to constraints.

$$x_1 + 2x_2 + 3x_3 = 15$$
$$2x_1 + x_2 + 5x_3 = 20$$
$$x_1 + 2x_2 + x_3 + x_4 = 10$$
$$x_1 > 0, x_2 > 0, x_3 > 0, x_4 > 0$$

Q.10 Use Dual simplex method to solve L.P.P.

Minimize $Z = x_1 + x_2$

Subject to constraints.

$$2x_1 + x_2 > 2$$
$$-x_1 - x_2 > 1$$
$$x_1 > 0, x_2 > 0,$$

OR

Consider the following parametric linear programming problem.

Maximize $Z = (3 - 6\lambda)x_1 + (2 - 2\lambda)x_2 + (5 + 5\lambda)x_3$

Subject to constraints.

$$x_1 + 2x_2 + 3x_3 < 430$$
$$3x_1 + 2x_3 < 460$$
$$x_1 + 4x_2 < 420$$
$$x_1, x_2, x_3 > 0$$

Find the range of λ over which the solution remains basic feasible and optimal.

Q.11 Define Goal programming problem. Use simplex method to solve following Goal programming.

Minimize $Z = P_1Q_1^- + P_2d_2^- + 2P_2d_2^- + P_3d_1^+$

Subject to constraints.

$$10x_1 + 10x_2 + d_1^- - Q_1^+ = 400$$
$$x_1 + d_2^- = 40$$
$$x_2 + d_3^- = 36$$
$$x_1, x_2, d_1^-, d_2^-, d_3^- > 0$$

OR

The XYZ company has 5 jobs, I, II, III, IV, V to be done and 5 man A, B, C, D, E to do these jobs. The number of hours each man would take to accomplished each job is given by the following table.

	A	B	C	D	E
I	16	13	17	19	20
II	14	12	13	16	17
III	14	11	12	17	18
IV	5	5	8	8	11
V	5	3	8	8	10