

[This question paper contains 6 printed pages.]

Sr. No. of Question Paper : 244

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Your Roll No.....

Unique Paper Code : 236551

Name of the Paper : Network Analysis & Theory of Sequencing

Name of the Course : B.A. Programme – Operational Research

Semester : V

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Five** questions.

1. (a) Define the following terms with suitable example

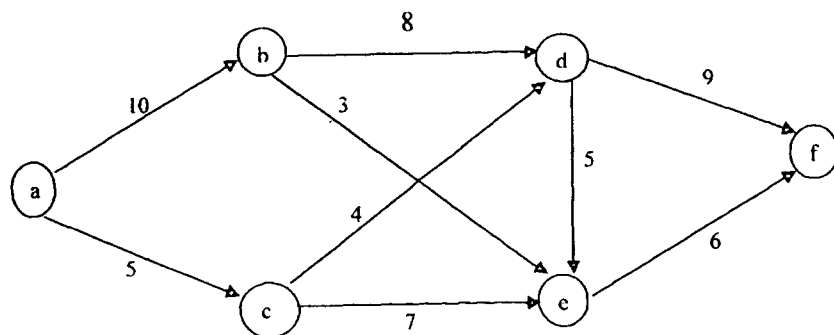
(i) Nodes, Links and flows

(ii) Paths, Cycles and Trees

(iii) Connected and Disconnected network

(6)

(b) What is a maximal flow problem in networks ? Consider the maximal flow problem for the network below. The source is node “a” sink is node “f” and the link capacities are shown on the directed links :



P.T.O.

(i) Use the augmenting path algorithm to solve it.

(ii) Determine any two cuts and find their capacities. (9)

2. (a) Explain the importance of sequencing problem. What are various methods of solving sequencing problem? Briefly explain them. (6)

(b) There are five jobs, each of which must go through the two machines A and B in the order AB. Processing times are given below :

Processing time (hours)					
Job	1	2	3	4	5
Time for A	5	1	9	3	10
Time For B	2	6	7	8	4

Determine a sequence for five jobs that will minimize the elapsed time T. Calculate the total idle time for the machines in this period. (9)

3. (a) What is a project? Give two examples. List the four important distinct features that are common to all projects. (5)

(b) Tasks A, B, C, ..., H, I constitute a project. The notation $X < Y$ means that the task X must be finished before Y can begin. With this notation :

$A < D, A < E, B < F, D < F, C < G, C < H, F < I, G < I.$

Task	A	B	C	D	E	F	G	H	I
Task Duration (Days)	5	3	5	4	3	5	3	2	3

(i) Draw the network diagram.

(ii) Identify critical path and find the total project duration.

(iii) Determine total, free and independent floats. (10)

4. (a) Use graphical method to minimize the time required to process the following jobs on the machines. For each machine specify the job which should be done first. Also calculate the total elapsed time to complete both jobs.

Job 1	Machine Sequence	A	B	C	D	E
	Time (hrs.)	6	8	4	12	4
Job 2	Machine Sequence	B	C	A	D	E
	Time (hrs.)	10	8	6	4	12

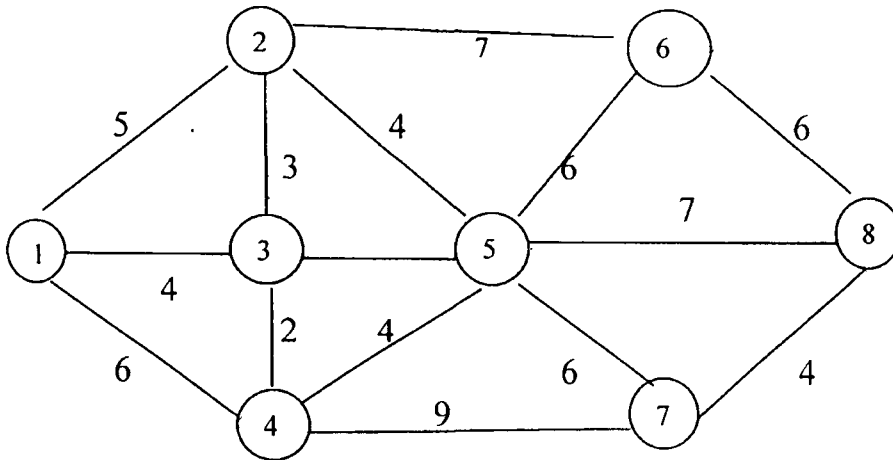
(7)

- (b) A salesman wants to visit cities 1, 2, 3 and 4. He does not want to visit any city twice before completing the tour of the cities and wishes to return to his home city, the starting station. Cost of going from one city to another in rupees is given in table below. Find the least cost route by the branch and bound method.

		To city			
		1	2	3	4
From city	1	∞	3	8	5
	2	4	∞	14	3
	3	4	5	∞	2
	4	7	8	13	∞

(8)

5. Consider the following network :



(a) Use Dijkstra's algorithm to determine a shortest path from 1 to 8. (8)

(b) Determine the minimal spanning tree. (7)

6. (a) Write short notes on the following :

(i) Seven Bridges of Konigsberg.

(ii) Chinese Postman Problem. (6)

- (b) The time estimates (in weeks) for the activities of a PERT network are given below :

Activity	Optimistic (t_o)	Pessimistic (t_p)	Most Likely (t_m)
1-2	1	7	1
1-3	1	7	4
1-4	2	8	2
2-5	1	1	1
3-5	2	14	5
4-6	2	8	5
5-6	3	15	6

- (a) Draw the project network and identify all the paths through it.
 (b) Determine the expected project length.
 (c) Calculate the standard deviation and variance of the project length. (9)
7. The following table gives the activities in a construction project and other relevant information :

Activity	Normal		Crash	
	Time(days)	Cost(Rs.000)	Time(days)	Cost(Rs.000)
1-2	5	10	6	22
1-3	8	9	7	35
2-3	6	11	2	20
2-4	5	8	4	14
3-4	10	6	5	16
3-5	3	5	3	9
4-6	12	4	7	4
5-6	5	7	4	10

Indirect cost Vary as follows :

Days :	15	14	13	12	11	10	9	8	7	6
Cost (Rs'000) :	600	500	400	250	175	100		75	50	35

Find the optimum duration and the associated minimum project cost.

(15)