

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 5022

D

Your Roll No.....

Unique Paper Code : 236562

Name of the Course : B.Sc. Mathematical Sciences

Name of the Paper : Network Analysis and Theory of Sequencing (ORP-5)

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.
3. All questions carry equal marks.

1. (a) Explain the basic assumptions made while dealing with the sequencing problems. What is 'no passing' rule in a sequencing algorithm. Distinguish between 'Flow shop' and 'Job shop' sequencing problem. (6)

(b) Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information —

(Order of processing of jobs is A B C D)

Jobs

	I	II	III	IV
Machine A (in hr.)	15	12	16	17
Machine B (in hr.)	5	2	3	3
Machine C (in hr.)	4	10	5	4
Machine D (in hr.)	15	12	16	17

(9)

P.T.O.

2. (a) Define the following terms –

(i) Network

(ii) Path and chain

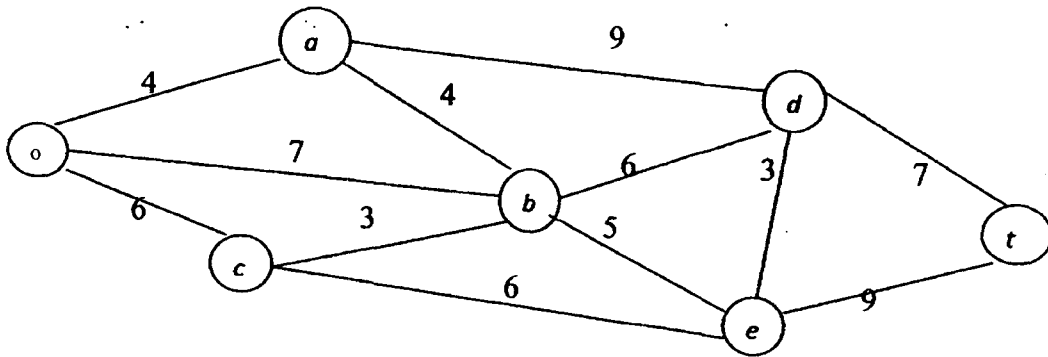
(iii) Cut and minimal cut

(iv) Flow augmenting path

(9)

(b) Describe a 'maximal flow' problem in a network by giving a real life example and formulate it as a linear programming problem. (6)

3. (a) . Explain shortest path problem and find the shortest path for the following network from o to t by Dijkstra's algorithm – (8)



(b) What do you understand by Minimal spanning tree in a network ? Explain by giving its real life application and describe the procedure of finding Minimal spanning tree in a network. (7)

4. A project consists of a series of tasks labeled A,B.....H,I with the following relationship (W<X, Y means X and Y cannot start until W is completed; X,Y<W means W cannot start until both X and Y are completed. With this notation, construct the network diagram having the following constraints :

A<D,E; B,D<F; C<G; B,G<H; F,G<I

Find also (i) the completion time of the project (ii) Earliest start & finish time of activities (iii) latest start & finish time of activities (iv) total, free and independent floats of activities.

The time in days of completion of each task is as follows –

Task	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10

(15)

5. A project is consisting of the following activities –

Activity	Duration (in days)		
	Optimistic	Pessimistic	Most likely
1-2	7	17	9
1-3	10	60	20
1-4	5	15	10
2-5	50	110	65
2-6	30	50	40
3-6	50	90	55
3-7	1	9	5
4-7	40	68	48
5-8	5	15	10
6-8	20	52	27
7-8	30	50	40

- Draw the project network.
- Find the expected duration and variance of each activity. What is expected project length and critical path of the network.
- Calculate the standard deviation of project length.
- What is the probability of completing the project in 130 days.
- Which due date has 98% chance of being met.

(15)

P.T.O.

6. (a) Explain the nature of travelling salesman problem and give its mathematical formulation. (7)
- (b) A network has the following capacitance matrix :

	S	X1	X2	X3	X4	t
S	–	10	12	8	0	0
X1	0	–	6	14	5	0
X2	0	0	–	12	9	6
X3	0	0	1	–	3	5
X4	0	0	0	1	–	7
t	0	0	0	0	0	–

Draw the diagram of the network . Using labeling technique, find the maximal flow in the network. (8)

7. (a) A salesman must travel from city to city to maintain his accounts. He leaves his home city A and has to visit each other cities and return home. The table shows the distances (in km.) between various cities. Determine the optimal tour.

To–	A	B	C	D	E
From A	–	375	600	150	190
B	375	–	300	350	175
C	600	300	–	350	500
D	150	350	350	–	300
E	190	175	500	300	–

- (b) Describe the algorithm to solve 2 jobs m machine job shop problem. (8)