[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2821 **A**

Unique Paper Code : 62364447

Name of the Paper : Network models and Scheduling Techniques

Name of the Course : **B.A. (P)**

Semester : IV

Duration : 3.30 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) Show that a transportation problem is a special type of LP problem. In what areas of management can the transportation model be effectively used? Discuss.

(b) A manufacturer has distribution centres at Agra, Allahabad and Kolkata. These centres have availability of 40, 20 and 40 units of his product, respectively. His retail outlets at A, B, C, D and E require 25, 10, 20, 30 and 15 units of the products, respectively. The transport cost (in rupees) per unit between each centre outlet is given below:

Distribution Centre	Retail Outlets				
	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Kolkata	40	60	95	35	30

Determine the optimal distribution so as to minimize the cost of transportation.

P.T.O.

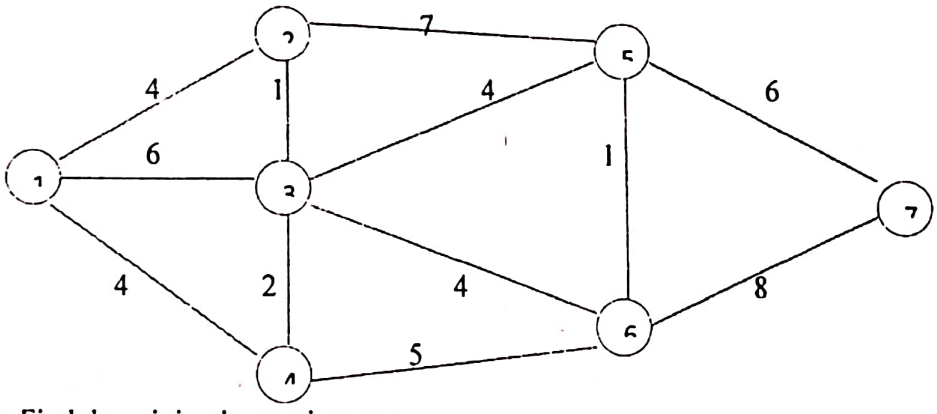
2(a) What is an assignment problem? Give two applications. Explain the difference between a transportation problem and an assignment problem.

(b) The marketing director of a multi-unit company is faced with a problem of assigning 5 senior managers to six zones. From past experience he knows that the efficiency percentage judged by sales, operating costs, etc., depends on the manager-zone combination. The efficiency of different managers is given below:

		Zones					
		I	II	III	IV	V	VI
Manager	A	73	91	87	82	78	80
	B	81	85	69	76	74	85
	C	75	72	83	84	78	91
	D	93	96	86	91	83	82
	E	90	91	79	89	69	76

Find out which zone should be managed by a junior manager due to the non-availability of a senior manager.

3 (a) Consider the following network where the numbers in links represent actual distance between the corresponding nodes:



(i) Find the minimal spanning tree.

(ii) Use Dijkstra's labeling procedure to determine the shortest route between nodes 1 to 7.

(b) What is a residual network? Explain its role in determining an augmenting path.

4(a) "Network provide a natural way of graphically displaying the flow of activities in a project". Explain.

(b) Delhi Medical Association is considering holding a conference. The following table gives the list of activities involved, their immediate predecessors, and their duration (in days):

Activity	Description	Predecessor	Duration(days)
A	Design conference meetings and theme	-	3
B	Design front cover of the conference proceedings	A	2
C	Prepare brochure and send request for papers	A	6

D	Compile list of distinguished speakers/guests	A	3
E	Finalize brochure and print it	C,D	7
F	Make travel arrangements for speakers/guests	D	4
G	Dispatch brochures	E	3
H	Receive papers for conference	G	25
I	Edit papers and assemble proceedings	F,H	10
J	Print proceedings	B,I	20

(i) Prepare a network diagram showing the interrelationships of the various activities.

(ii) Find the total time required to hold the conference.

(iii) Compute the total, free and independent floats for each activity.

5(a) 'PERT takes care of uncertain durations.' How far is this statement correct? Explain with reasons.

(b) A project has the following activities and other characteristics:

Activity	Preceding Activity	Time Estimates		
		Optimistic	Most Likely	Pessimistic
A	-	4	7	16
B	-	1	5	15
C	A	6	12	30
D	A	2	5	8
E	C	5	11	17
F	D	3	6	15
G	B	3	9	27
H	E,F	1	4	7
I	G	4	19	28

(i) Draw the network diagram for the project.

(ii) Identify the critical path.

(iii) Determine the mean project completion time.

(iv) Find the probability that the project is completed in 36 weeks.

6. The table below provides cost and gives estimates of seven activities of the project :

Activity	*Normal*		*Crash*	
	Time(weeks)	*Cost(Rs.000)*	*Time(weeks)*	*Cost(Rs.000)*
1-2	2	10	1	15
1-3	8	15	5	21
2-4	4	20	3	24
3-4	1	7	1	7
3-5	2	8	1	15
4-6	5	10	3	16
5-6	6	12	2	36

Indirect cost for the project is Rs. 100 per week.

(i) Draw the project network corresponding to normal time.

(ii) Determine the critical path and the normal duration and normal cost of the project.
(iii) Crash the activities so that the project completion time reduces to 9 weeks, with minimum additional cost.

7. Define the following terms with suitable example;

(i) Nodes, Links and flows,
(ii) Paths, Cycles and Trees,
(iii) Connected and Disconnected network,
(iv) Looping, Dangling and Independent Relationship,
(v) Resource levelling and resource smoothing.