

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5760

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Unique Paper Code : 62353506

**Name of the Paper : SEC – Transportation and
Network Flow Problems**

Name of the Course : B.A. Programme

Semester : V

Duration : 3 Hours

Maximum Marks : 55

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any two parts from each question.
3. All parts of questions 1, 2 and 3 are of 7 marks. All parts of question 4 are of 6.5 marks.

1. (a) An automobile company has three plants in Bangalore, Punjab, and Chennai and four major distribution centers in Delhi, Haryana, Mumbai,

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and Goa. The capacities of the three plants during the next quarter are 1200, 1800 and 1000 respectively. The quarterly demands at the four distribution centers are 1100, 1700, 500 and 700 respectively. The transportation cost per car (in Rs.) on the different routes is given in the table. (7)

From \ To	Delhi	Haryana	Mumbai	Goa
Bangalore	5	3	7	6
Punjab	3	2	5	5
Chennai	4	7	6	2

- (i) Formulate the transportation problem as an LP model to minimize the total transportation cost.
 - (ii) Determine the initial basic feasible solution using northwest-corner method.
- (b) Compare the starting solutions obtained by the Least-Cost and Vogel's Approximation method for the model (7)

From \ To	D1	D2	D3	Supply
S1	0	2	1	6
S2	2	1	5	7
S3	2	4	3	7
Demand	5	5	8	

- (c) Determine the optimal transportation cost of the following table, which summarizes the supply, demand, and cost information (per unit in Rs.) for three factories shipping goods to four warehouses.
- (7)

From \ To	W1	W2	W3	W4	Supply
F1	10	2	20	11	15
F2	12	7	9	20	25
F3	4	14	16	18	10
Demand	5	15	15	15	

2. (a) Define the assignment problem. Express the assignment problem in mathematical form between n sources and n destinations. Is the assignment model a special case of the transportation model? If yes, explain.
- (7)

- (b) A shop owner is facing with a problem of assigning five different workers to five different jobs. The assignment costs are given in the following table. Solve the problem to minimize total assignment cost. (7)

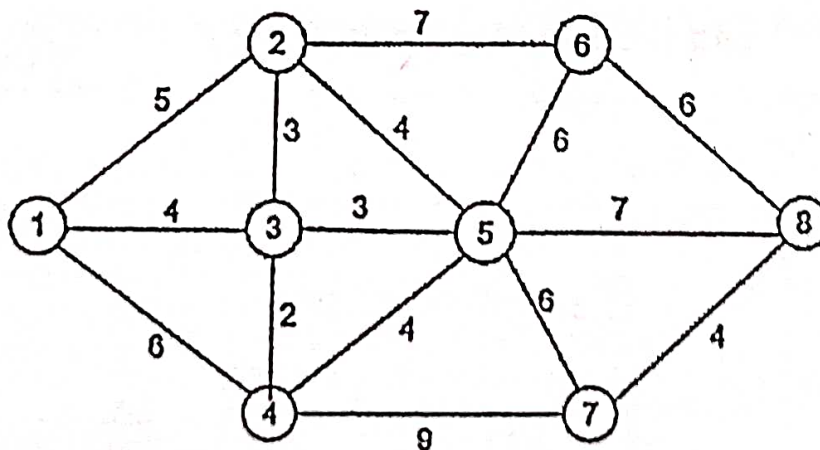
<i>Jobs</i>	J1	J2	J3	J4	J5
<i>Workers</i>					
W1	8	4	2	6	1
W2	0	9	5	5	4
W3	3	8	9	2	6
W4	4	3	1	0	3
W5	9	5	8	9	5

- (c) A book salesperson who lives in City 1 must visit once a month on four customers located in City 2, City 3, City 4 and City 5. The following table gives the distances in Kms among the different

cities. Minimize the total distance traveled by the salesperson. (7)

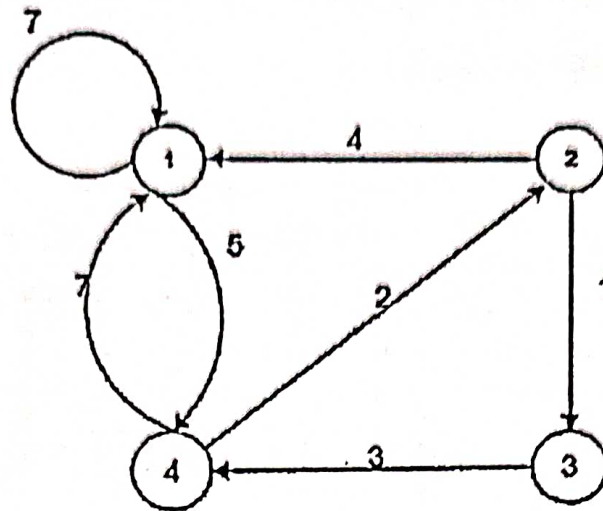
From City	To City				
	City 1	City 2	City 3	City 4	City 5
City 1	∞	120	220	150	210
City 2	120	∞	80	110	130
City 3	220	80	∞	160	185
City 4	150	110	160	∞	190
City 5	210	130	185	190	∞

3. (a) Find the minimal spanning tree of the following network : (7)



- (b) For the network in the following figure, use Floyd's algorithm to find the shortest routes between all pairs of nodes. The distances are given in kilometres on the arcs.

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(7)

(c) 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) :

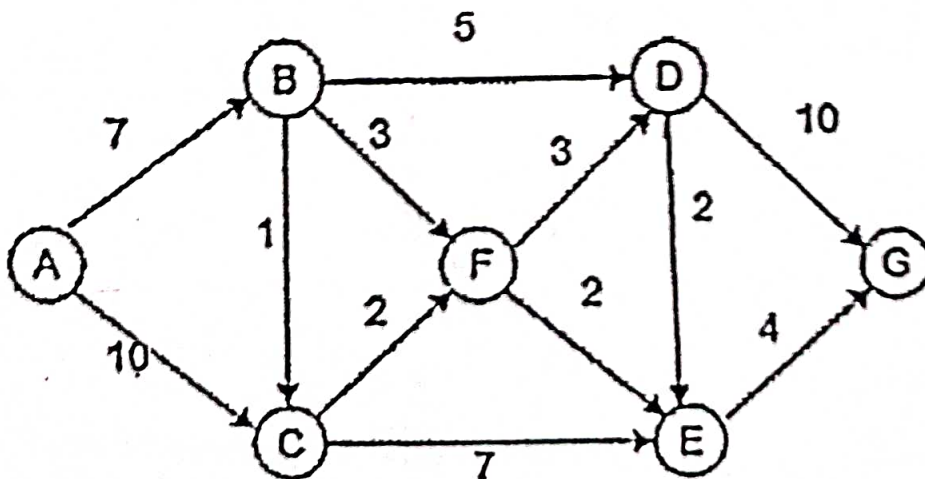
Activity	Description	Predecessor	Duration (days)
A	Design conference meetings and theme	-	3
B	Design front cover of the conference proceedings	A	2
C	Prepare brochure and send request for papers	A	6
D	Compile list of distinguished speakers/guests	A	3
E	Finalize brochure and print it	C,D	7
F	Make travel 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

(7)

- (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.

4. (a) Use Dijkstra's algorithm to determine a shortest path between node 1 to node 8 of the network given in Q3(a). (6.5)

(b) Determine the maximum flow in the given network where the source node is node-A, sink node is node-G and the link capacities are shown on the directed links. (6.5)



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- (c) A project has the following activities and other characteristics : (6.5)

Activity	Preceding Activity	Time Estimates(in weeks)		
		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.