This question paper contains 4+1 printed pages]

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S. No. of Question Paper : **2434**

Unique Paper Code : **2362601**   **F-4**

Name of the Paper   : **Network Models and Project Scheduling**

Name of the Course   : **B.Sc. (Hons.) Mathematics/Statistics : Allied Course**

Semester   : **IV**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer any *Five* questions.

All questions carry equal marks.

Simple calculators are allowed.

1. (*a*) Explain assignment problem as a special case of transportation problem.   3

    (*b*) Give the linear programming formulation of an assignment problem.   6

    (*c*) Four men are available to do four different jobs. The time each man takes to do each job is known and is given in the following table :

Job

		I	II	III	IV
	A	2	9	2	7
Person	B	6	8	7	6
	C	4	6.	5	3
	D	4	2	7	3

Use Hungarian method to assign the different jobs to the different persons.   6

P.T.O.

2. Describe the various methods to find the initial basic feasible solution to a transportation problem. The table below provides all the necessary information for a transportation problem, obtain the optimum transportation cost for the company.   4+11=15

Market

		P	Q	R	S	Supply
	A	6	3	5	4	22
Warehouse	B	5	9	2	7	15
	C	5	7	8	6	8
	Demand	7	12	17	9	45

3. Define a Travelling Salesperson problem. Explain the branch and bound method to find its solution. Consider the following cost matrix of a travelling salesperson visiting 5 cities :

$$\begin{bmatrix} \infty & 43 & 21 & 20 & 10 \\ 12 & \infty & 9 & 22 & 30 \\ 20 & 10 & \infty & 5 & 13 \\ 14 & 30 & 42 & \infty & 20 \\ 44 & 7 & 9 & 10 & \infty \end{bmatrix}$$

Use branch and bound technique to find the shortest distance tour for the travelling salesperson.   2+6+7=15

4. (a) Formulate the shortest path problem as a linear programming problem.   5

    (b) Use Dijkstra's algorithm to find the shortest path for the following network :   10
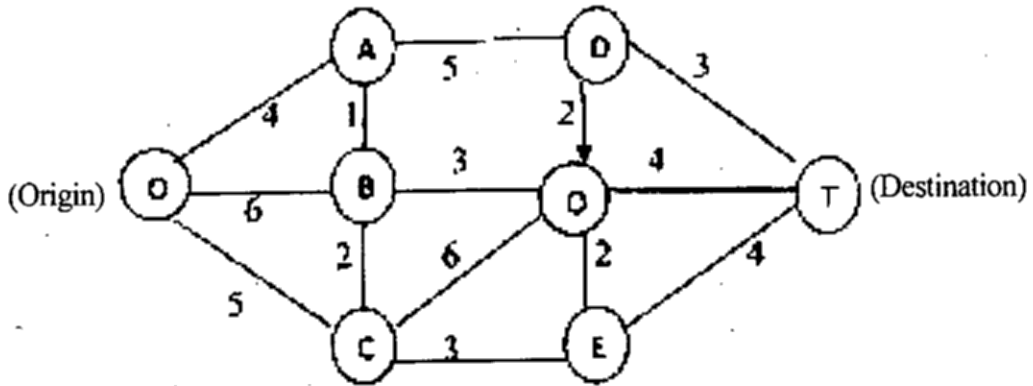
5. Consider the following project :

Activitiy	Time Estimates in Weeks			Predecessors
	Optimistic	Most Likely	Pessimistic	
A	3	6	9	None
B	2	5	8	None
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1	5	15	E

    (i) Draw the project network.

(ii)   Find the expected duration and variance of each activity.

(iii) What is the expected project length and critical path of the network ?

(iv)   What is the probability that the project will be completed by 18 weeks ?   3+4+4+4=15

6.   The following table lists the normal and crash duration (in days) along with the cost of crashing

(Rs.) for the various activities in a project :

Activities	Normal Duration (days)	Crash Duration (days)	Crashing Cost (Rs. per day)
1—2	9	6	20
1—3	8	5	25
1—4	15	10	30
2—4	5	3	10
3—4	10	6	15
4—5	2	1	40

(i)   What is normal and minimum project length ?

(*ii*) If the overhead cost is Rs. 60 per day then what is the optimal length of the project maintaining the time/cost trade off ?

(*iii*) Which activities will be crashed and by how much ?   4+8+3=15

7. Explain any *three* of the following :   3×5=15

(*i*) Balanced and unbalanced transportation problem

(*ii*) Difference between PERT and CPM

(*iii*) Various types of floats of activities in a project

(*iv*) Real life applications of travelling salesman problem.