Name of Course	: **CBCS (LOCF) B.Sc. (Math Sci II; Phy Sci-II)**
Unique Paper Code	: **42353504**
Name of Paper	: **SEC- Transportation and Network Flow Problems**
Semester	: **V**
Duration	: **3 hours**
Maximum Marks	: **55 Marks**

*Attempt any **four** questions. All questions carry equal marks.*

1. Consider the transportation model in the given table:

	D1	**D2**	**D3**	**D4**	**D5**	**Supply**
S1	11	13	15	20	18	80
S2	18	16	21	14	12	100
S3	17	23	9	13	16	120
S4	16	22	10	8	15	70
Demand	70	60	90	90	60	

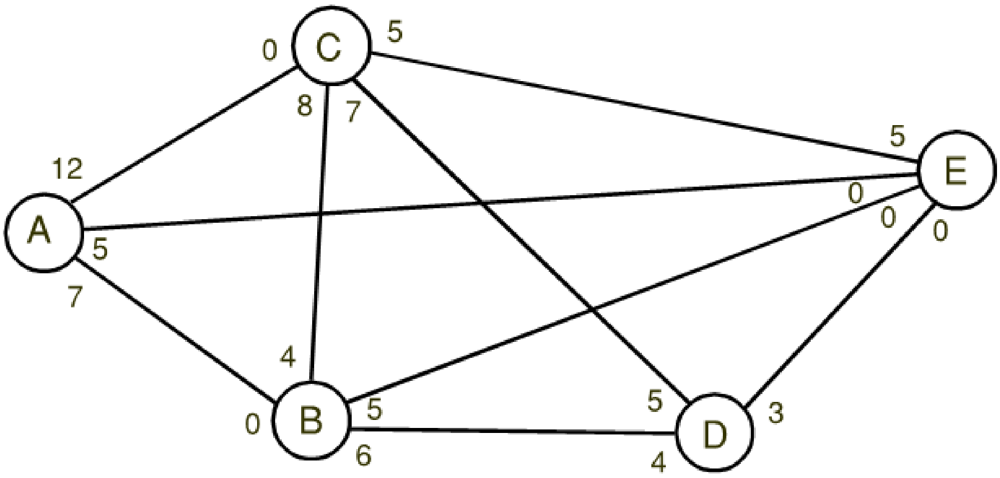
Determine the initial basic feasible solution of the transportation model using Vogel's Approximation Method (VAM) and North West Corner Method. Find the optimal solution using the initial basic feasible solution obtained from Vogel's Approximation Method. Does this model have alternate optimal solution? Justify your answer.

2. A company has four jobs and five machines. The cost of each job on each machine is given in the following cost table:

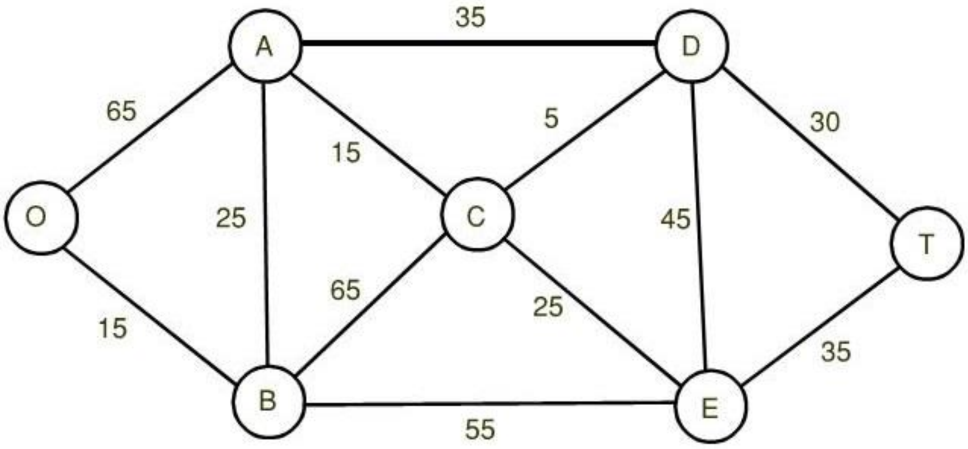
Machines / Jobs	**M1**	**M2**	**M3**	**M4**	**M5**
J1	22	20	15	10	17
J2	21	18	10	7	16
J3	16	12	5	5	12
J4	20	20	17	15	16

Determine the job assignment to the machines so as to minimize the total cost using Hungarian Method with explanation.

3. In the network shown below, find the flow pattern that gives the maximal flow from node **A** (source) to node **E** (sink) where the arc capacities are mentioned on respective arcs. Also, compute the optimum flow in each arc along with the direction of flow.



4. In the following network the distance (in miles) between different stations is shown on each link. Determine the shortest route from Station **O** to Station **T** using Dijkstra's algorithm.



5. A, B, C and D are four different cities. A salesman must travel from city to city to maintain his accounts. The cost of travelling between the various cities is shown in the matrix given below:

		To city			
		A	B	C	D
From city	A	∞	4	7	3
	B	4	∞	6	3
	C	7	6	∞	7
	D	3	3	7	∞

The home city is city B. Determine the tour that will minimize the total cost of visiting all cities and returning home.

6. A small project involves 7 activities, and their time estimates are listed in the following table.

Activities are identified by their beginning (i) and ending (j) node numbers

Activity	Estimated Duration (weeks)		
$(i-j)$	Optimistic	Most Likely	Pessimistic
$1-2$	1	1	7
$1-3$	1	4	7
$1-4$	2	2	8
$2-5$	1	1	1
$3-5$	2	5	14
$4-6$	2	5	8
$5-6$	3	6	15

(a) Draw the network diagram of the activities in the project.

(b) Find the expected duration and variance for each activity. What is the expected project length?

(c) Calculate the variance and standard deviation of the project length.