



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

**B.Sc. (General) Degree
Third Year – Semester II Examination– April/May 2016**

MAT 3302 – Network Optimization

Answer five questions only.

Time allowed: Three Hours

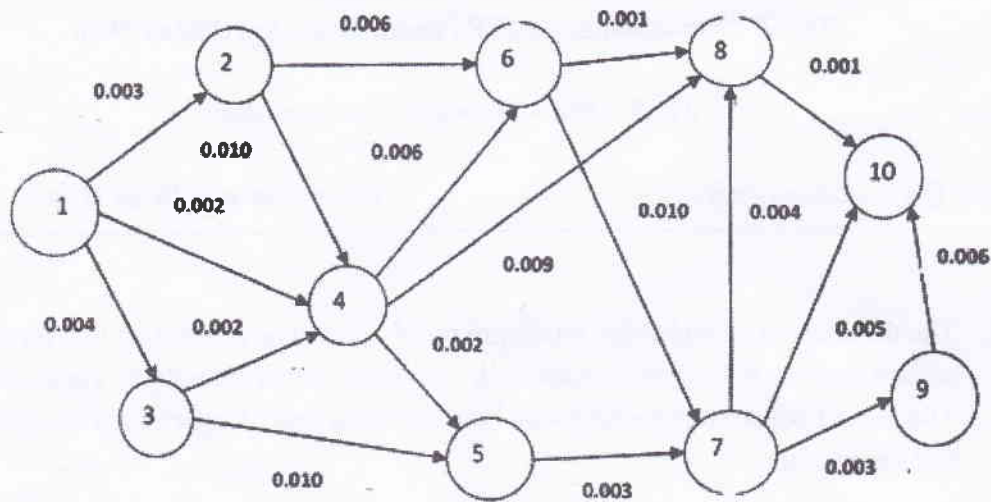
1. The department of highways wishes to build enough new roads so that five towns in a certain country will all be connected to one other either directly or via another town. The cost of constructing a highway between each pair of towns is given in the following table.

From/to	1	2	3	4	5
1	0	5	50	80	90
2		0	70	60	50
3			0	8	20
4				0	10
5					0

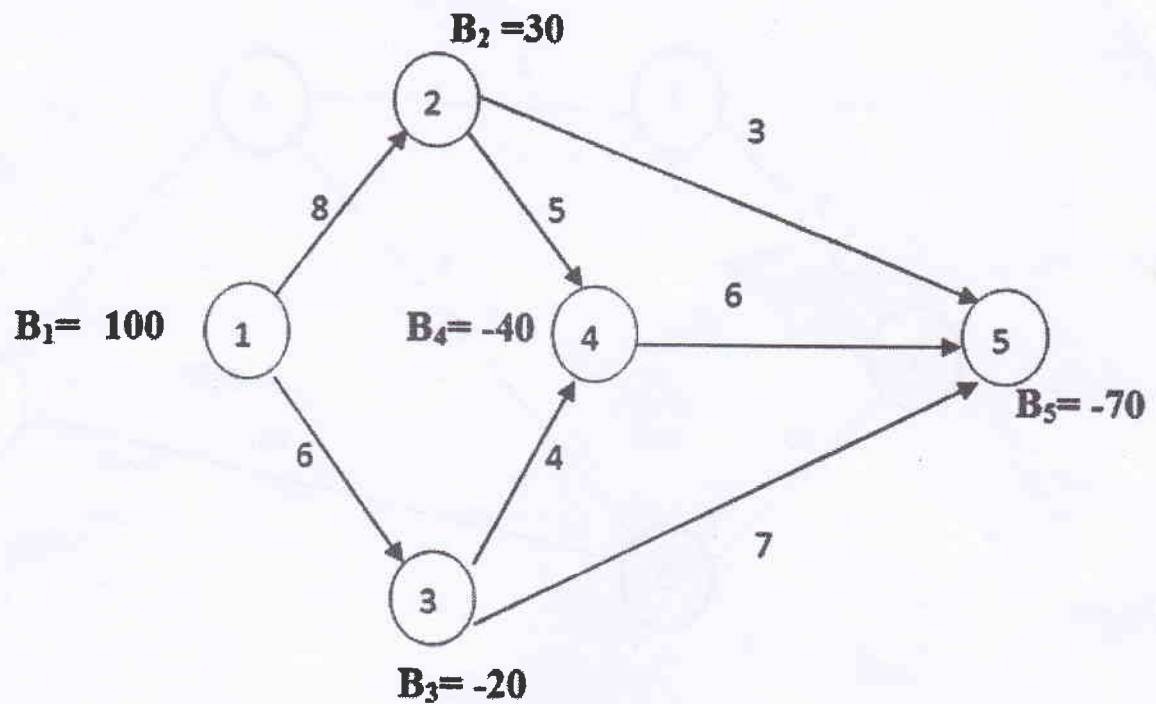
Consider the each town as a vertex and the connection between the towns as edges.

- i. Using above data create a complete network G .
 - ii. Find the minimum cost highway network to using suitable technique and mention the technique.
- 2.
- i. Discuss the difference between Dijkstra's Algorithm and Floyd's Algorithm.
 - ii. Safety Trans is a trucking company that specializes transporting extremely valuable and extremely hazardous materials. Due to the nature of the business, the company places great importance on maintaining a clean driving safety record. This not only helps keep their reputation up but also helps keep their insurance premium down. The company is also conscious of the fact that when carrying hazardous materials, the environmental consequences of even a minor accident could be disastrous.

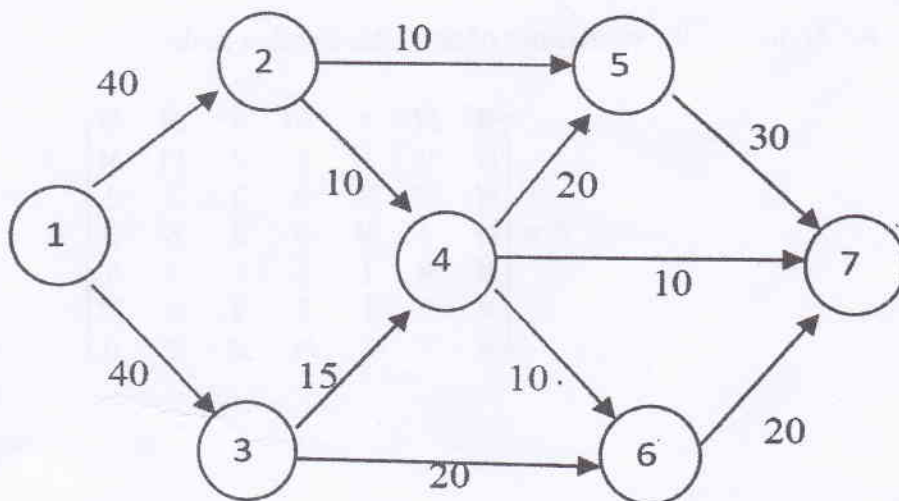
Safety Trans likes to ensure that it selects routes that are least likely to result in an accident. The company is currently trying to identify the safest routes for carrying a load of hazardous materials from **Node 1** to **Node 10**. The following network summarizes the routes under consideration. The numbers on each arc represent the probability of having an accident on each potential leg of the journey.



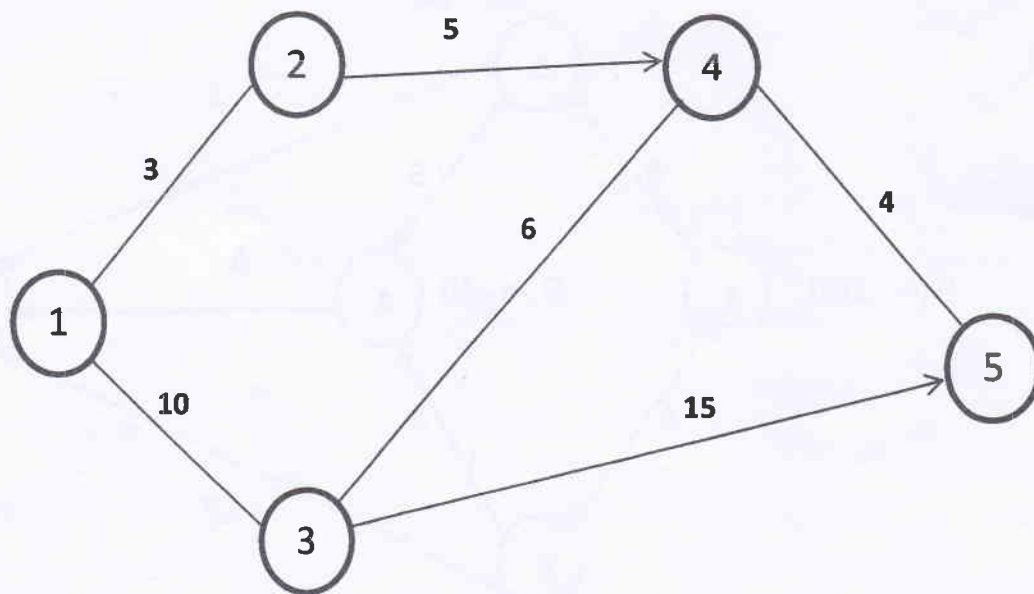
- a. What is the suitable Algorithm to find the shortest route between **Node 1** to **Node 10**.
 - b. Using above (a) mentioned algorithm find the shortest route between **Node 1** to **Node 10** to minimize the accident probability.
3. Find the minimal cost flow of given bellow network.
Use edges $\{(1, 3), (2, 4), (3, 4) \text{ and } (4, 5)\}$ as the initial spanning tree.



4. Using the Maximal flow Algorithm, find the maximal flow between node 1 to node 7 of bellow network.



5. For the network in the bellow figure, find the shortest routes between every two nodes by using the Floyd's algorithm. The distances (in miles) are given on the arcs. Arc (3, 5) and (2, 4) are directional- no traffic is allowed from node 5 to node 3 and from node 4 to node 2. All the other arcs allow two-way traffic.



6. Given the following weight matrix A , draw the network. Use the Dijkstra's algorithm to find the shortest distance from vertex 3 to every other vertex in the network and draw the shortest distance tree rooted at vertex 3.

- M denotes the restrictions of one node to other node.

$$A = \begin{bmatrix} 0 & M & 4 & 10 & 3 & M & M \\ M & 0 & 1 & 1 & 2 & 11 & M \\ M & M & 0 & 8 & 3 & 2 & 1 \\ M & 4 & M & 0 & 8 & 6 & 3 \\ M & M & 1 & 2 & 0 & 3 & 1 \\ M & 1 & 1 & 3 & 2 & 0 & M \\ 6 & M & 3 & M & M & 2 & 0 \end{bmatrix}$$
