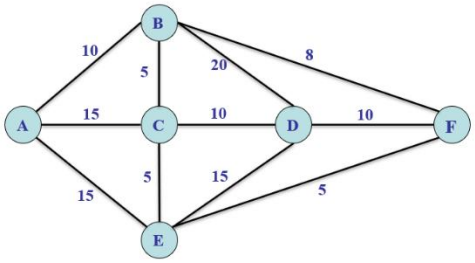
Q.1 Define Bipartite Graph, Isomorphism, and Traversal. What is the difference between Eulerian and Hamiltonian paths? How can you represent a graph in computer memory? — 6

Q.2 In a computer network, every connection between computers can be represented as an edge in a graph, and each computer is represented as a vertex. If a network has 8 computers and the degrees of these computers (i.e., the number of connections each computer has) are as follows: — 6

Computer A: 3 connections	Computer B: 2 connections	Computer C: 4 connections
Computer D: 3 connections	Computer E: 2 connections	Computer F: 1 connection
Computer G: 3 connections	Computer H: 2 connections	

Using the Handshaking Theorem: What is the total number of connections (edges) in the network? If one additional connection is added between Computer E and Computer F, what will be the new degrees of the affected computers, and what will be the updated total number of connections?

Q.3 Explain how Dijkstra's algorithm is applied in navigation systems like Google Maps to calculate the shortest driving, biking, or walking route between two locations. Consider the given graph to solve by algorithm, where vertices represent locations (intersections, or landmarks), and edges represent the roads connecting these locations. Each edge will have a weight corresponding to the travel time (in minutes) between the locations (A-F). — 2+5



Q.4 A cloud service provider has three data centers (sources) and four regional servers (destinations). The goal is to minimize the cost of sending data packets from data centers to regional servers, subject to the availability of data at the data centers and the demand at the regional servers. The transportation costs are measured in terms of latency or bandwidth usage. (Use Steppingstone method) — 7

	D_1	D_2	D_3	D_4	Supply
S_1	8	6	10	9	100
S_2	9	12	13	7	150
S_3	14	9	16	5	200
Demand	120	100	130	100	

Q.5 **Network Bandwidth Allocation** Scenario**:** Consider a computer network where data packets need to be sent from a source server to a destination server. The network can be represented as a directed graph, where: Vertices represent network nodes (servers or routers). Edges represent the communication links between nodes, with capacities indicating the maximum bandwidth (in Mbps) that can be utilized on each link. The goal is to determine the maximum bandwidth that can be allocated from the source server to the destination server using the Ford-Fulkerson algorithm. — 4