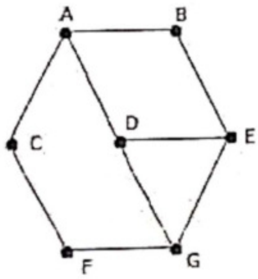
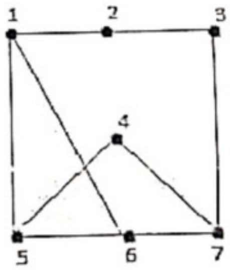
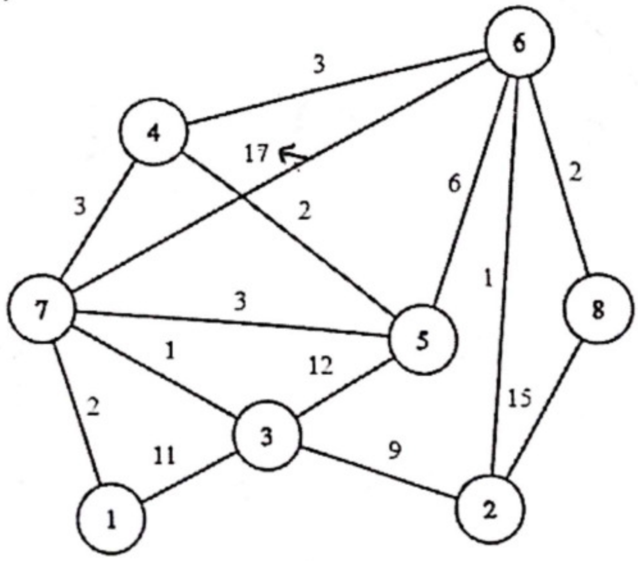
Daffodil International University
Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Examination, Summer 2025
Course Code: CSE212, Course Title: Discrete Mathematics

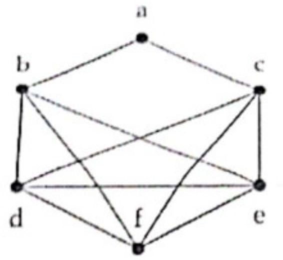
Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

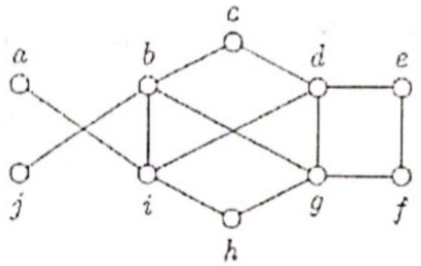
[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a) **Determine** whether the relation R on the set of all real numbers is reflexive, symmetric, antisymmetric, and/or transitive, where $(x, y) \in R$ if and only if $xy \geq 0$. Justify your answers.	[4]	[CO2]
	b) By using mathematical induction prove that the given equation is true for all positive integers. $1 \times 2 + 3 \times 4 + 5 \times 6 + \dots + (2n - 1) \times 2n = n(n+1)(4n-1)/3$	[6]	
2.	a) **Prove** whether the following graphs **G** and **G'** are **Isomorphic** or not.  Graph G  Graph G'	[5]	[CO3]
	b) **Apply** the concept of **Dijkstra**'s algorithm to find the shortest path from **Node 1** to **Node 8**. 	[5]	

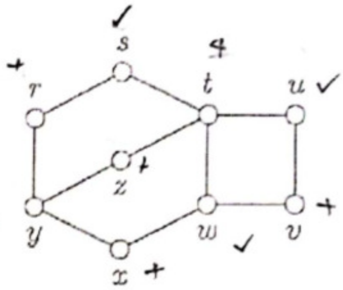
3. **a) Find out** if the graph below is **Eulerian** or **Hamiltonian** or both. If so, write the sequence of vertices of an **Eulerian circuit** and/or **Hamiltonian cycle**. If not, explain why it isn't **Eulerian** or **Hamiltonian**. [4] [CO3]



b) Justify whether each of the following graphs are **Bipartite** or not. If **Bipartite**, redraw the graph identifying the partite sets. If not, explain why they are not **Bipartite**. [6ss]

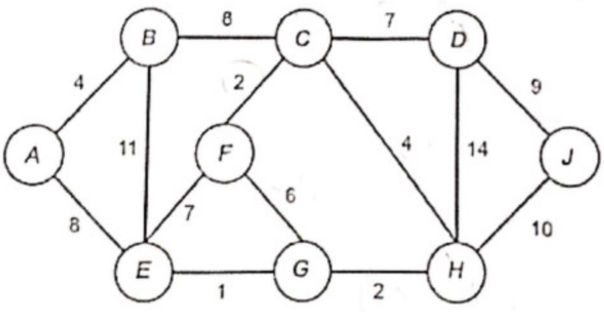


Graph: A



Graph: B

4. **a) Apply Prim**'s algorithm on the following graph starting at **Node A** to construct a **Minimum Spanning Tree (MST)** indicating the order in which edges are added to form the tree. and **find** the weight of the tree. [7] [CO3]



b) Draw Graph A from the following **adjacency matrix.** [3]

$$A = \begin{pmatrix} 0 & 2 & 3 & 0 & 0 \\ 2 & 0 & 15 & 2 & 0 \\ 3 & 15 & 0 & 0 & 13 \\ 0 & 2 & 0 & 0 & 9 \\ 0 & 0 & 13 & 9 & 0 \end{pmatrix}$$