Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Final Examination, Spring-2024

Course Code: CSE212   Course Title: Discrete Mathematics

Level: 2   Term: 1   Batch: 64

Exam Duration: 02 Hours **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.]

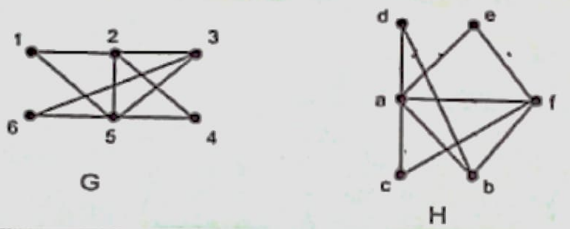
1. Consider the following adjacent matrix where a, b, c, d, e and f are the vertices of an undirected graph. CO3

	a	b	c	d	e	f
a	1	1	3	0	0	0
b	1	0	2	2	0	9
c	3	2	0	1	0	3
d	0	2	1	0	9	1
e	0	0	0	9	0	1
f	0	9	3	1	1	0

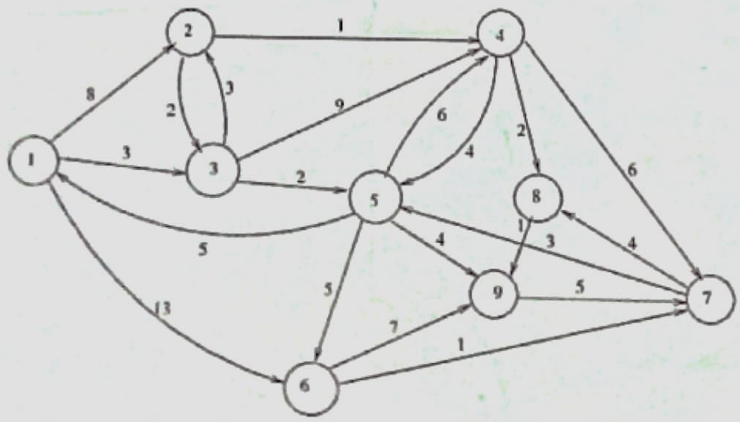
a) **Construct** a graph from the given matrix. [2]

b) **Prove** handshaking theorem for the graph. [3]

c) **Prove** whether the following graphs G and H are isomorphic or not? [5]

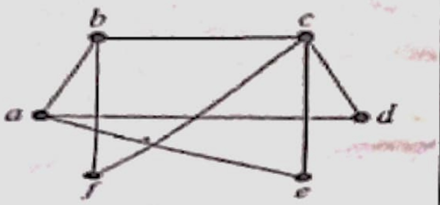


2. a) **Derive** a relation from the graph and find whether the relation is reflexive, symmetric, antisymmetric and transitive. If not make at least one relation putting the pair which are needed. [5] CO2

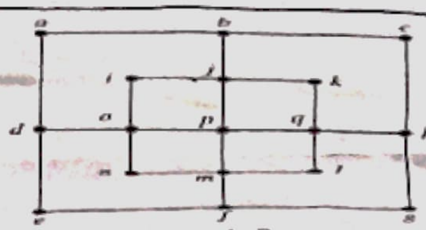


b) **Prove** that $2 - 2.7 + 2.7^2 - \cdots \ldots\ldots\ldots\ldots\ldots + 2.(-7)^n = (1 - (-7)^{n+1})/4)$ whenever n is a nonnegative integer. [5]

3. a)	**Draw** the following graphs and also **find out** the degree of each vertices of the graphs. i. $K_{4,7}$ ii. W_5	[5]	CO3
b)	**Apply** coloring algorithm to show whether the graphs are bipartite or not.	[5]	



Graph: A



Graph: B

4. Suppose that the nodes of Graph G are {a, b, c, d, e, g, h} and the weights of the edges in G are given in the following matrix. Here, the symbol (*) when there is no edge between a given pair nodes. (CO3)

	a	b	c	d	e	f	g	h
a	0	4	5	*	1	2	1	5
b	4	0	1	3	*	1	8	15
c	5	1	0	9	2	*	4	7
d	*	3	9	0	8	2	4	6
e	1	*	2	8	0	*	*	10
f	2	1	*	2	*	0	5	8
g	1	8	4	4	*	5	0	*
h	5	15	7	6	10	8	*	0

a)	Now, **Apply** Prim's algorithm, starting at node a, to construct a minimum spanning tree and find the weight based on the given matrix.	[5]
b)	**Apply** Dijkstra on this weighted graph to find the shortest path from a to h.	[5]