



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Semester Examination, Fall 2024

Course Code: CSE212, Course Title: Discrete Mathematics

Level: 2 Term: 1 Batch: 65

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 given relation is reflexive, symmetric, transitive, or none of these. Justify your answers:
- C is the circle relation on the set of real numbers:
For every $x, y \in \mathbb{R}$, $x C y \Leftrightarrow x^2 + y^2 = 1$.
 - D is the "divides" relation on $\mathbb{Z}^+$:
For all positive integers m and n, $m D n \Leftrightarrow m | n$

[4]

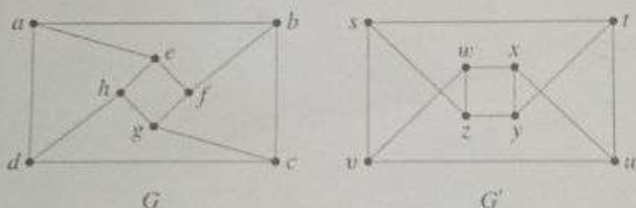
[CO2]

- b) Use mathematical induction to prove that for all non-negative integers n
- $$1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \dots + \frac{1}{2^n} = 2 - \frac{1}{2^n}$$

[6]

2. a) Prove whether the following graphs G and G' are isomorphic or not? ✓

[4]



[CO3]

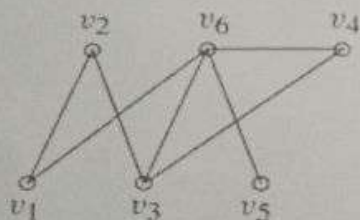
- b) Apply the concept of Dijkstra's algorithm to find the shortest path from a to z.

[6]

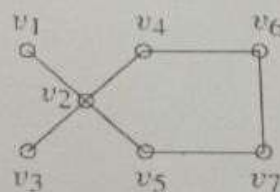


3. a) Justify whether the following graphs are bipartite or not. ✓

[7]



Graph: A



Graph: B

[CO3]

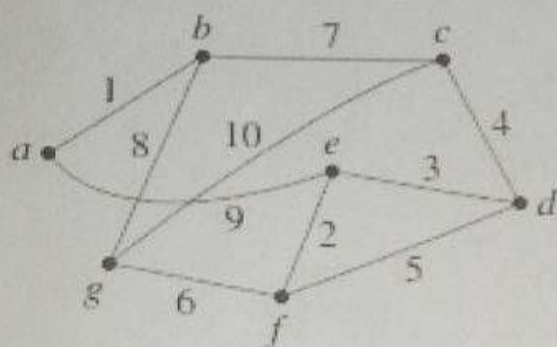
b) Draw these Graphs-

- i. C_5
- ii. $K_{4,3}$
- iii. W_7

[3]

4. a) Apply Prim's algorithm on the following graph starting at node a to construct a minimum spanning tree indicating the order in which edges are added to form each tree, and find the weight of the tree.

[7]



[CO3]

b) Draw a graph from the following adjacency matrix.

[3]

$$\begin{bmatrix} 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 2 & 1 \\ 1 & 1 & 2 & 0 & 0 \\ 2 & 1 & 1 & 0 & 0 \end{bmatrix}$$