



Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Examination, Summer 2026

Course Code: SE123; Course Title: Discrete Mathematics

Sections & Teachers: A,B,C,D (MSM), E,FG (MSI), H,I,J,K (AR), L,M(KNA), N,O (MIH)

Time: 2:00 Hrs

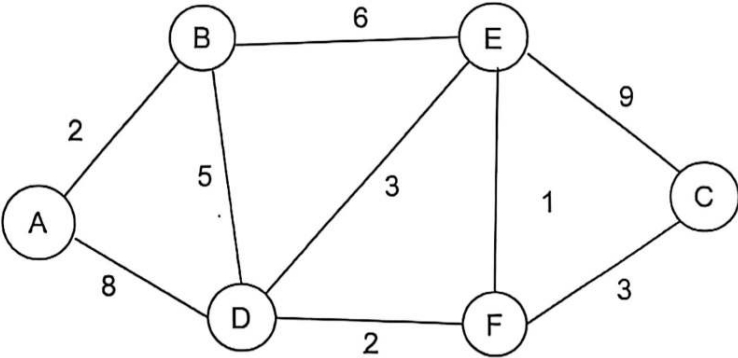
Marks: 40

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.	Analyze the following set X and relation R provided below: $X = \{2, 3, 4, 5\}$ and $R = \{(2, 2), (2, 3), (3, 2), (3, 4), (4, 4), (2, 4), (4, 5)\}$.	[Marks-4+6]	CLO-3 Level-4
a)	Implement the relation using a directed graph, a tabular array, and an arrow graph.		
b)	Determine if the relation R is reflexive, symmetric, and transitive. If yes, analyze why. If not, analyze which properties are not satisfied.		
2.	a) Demonstrate the component and your understanding of its function in the following context: 1. Range 2. Co-Domain 3. Image 4. Preimages	[Marks-4]	CLO-3 Level-4
	b) Examine the following function, and find out the injective, surjective and bijective function from f_1, f_2, f_3, f_4 . Consider the functions $f_1: A \rightarrow B, f_2: B \rightarrow C, f_3: C \rightarrow D$ and $f_4: D \rightarrow E$	[Marks-6]	

The diagram illustrates four functions between five sets: A, B, C, D, and E. Set A contains elements {a, b, c}, B contains {1, 2, 3, 4}, C contains {r, s, t, u}, D contains {v, w}, and E contains {x, y, z}. The functions are defined as follows: $f_1: A \rightarrow B$ maps a to 1, b to 2, and c to 3; $f_2: B \rightarrow C$ maps 1 to r, 2 to s, 3 to t, and 4 to u; $f_3: C \rightarrow D$ maps r to v, s to w, t to v, and u to w; $f_4: D \rightarrow E$ maps v to x and w to both y and z.

3.	Investigate the following hierarchy of Product Classification System. In a company: An e-commerce company organizes its products using a hierarchical classification system. • The main category is Electronic Products (EP). • Electronic Products have two major categories: Computing Devices (CD) and Smart Home Devices (SHD). • Computing Devices are divided into two sub-categories: Laptops (LP) and Desktop Computers (DC). • Smart Home Devices have one sub-category: Home Automation (HA). • Home Automation contains two sub-types: Smart Lighting (SL) and Smart Security Systems (SS). a) Sketch the tree structure of product dependencies and Identify the parent node, child nodes, leaf nodes, and root node in the structure. b) Compare the Pre-order, In-order, and Post-order traversal sequences and which one is better for fast searching.	[Marks- 4+6]	CLO-4 Level-5
4.	Analyze every steps of the Dijkstra algorithm to find the shortest path in the graph shown below.  <pre>graph LR; A --- 2 B; A --- 8 D; B --- 6 E; B --- 5 D; D --- 3 E; D --- 2 F; E --- 9 C; E --- 1 F; F --- 3 C;</pre>	[Marks-10]	CLO-4 Level-5