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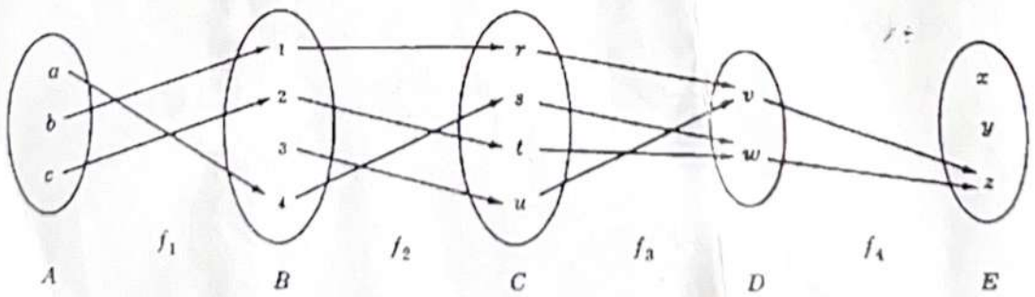
Daffodil International University

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

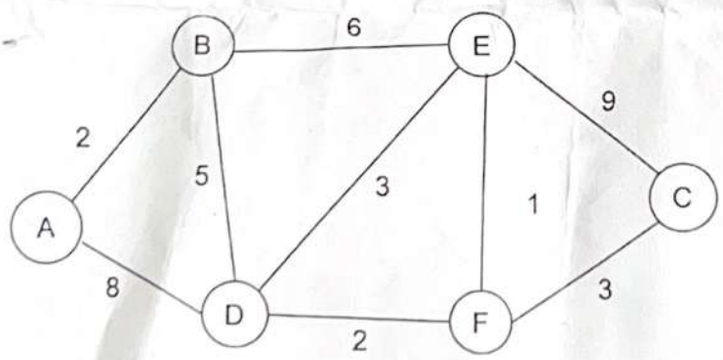
[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

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)}.			
	a)	Implement the relation using a directed graph, a tabular array, and an arrow graph.	[Marks-4+6]	CLO-3 *Level-4*
	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 3. Image 2. Co-Domain 4. Preimages	[Marks-4]	CLO-3 *Level-4*
	b)	Examine the following function, and find out the injective, surjective and bijective function from f1, f2, f3, f4. Consider the functions f1: A → B, f2: B → C, f3: C → D and f4: D → E	[Marks-6]	



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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.  	[Marks-10]	CLO-4 *Level-5*