Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Final Examination, Spring 2026
Course Code: SE123; Course Title: Discrete Mathematics; Batch: 45
Sections & Teachers: A-D (MSM), E-H (MMN), I-K (MSI), L (STR)

Time: 2:00 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.		Let, X = {1, 2, 3, 4} and Relation, R = {(1, 1), (2, 2), (3, 3), (1, 2), (3, 1)}.	[Marks-3+4+3]	CLO-3 *Level-4*
	a)	**Find** if the relation R is reflexive, symmetric, and transitive.		
	b)	**Express** graphically the relation using a directed graph, a tabular array, and an arrow graph.		
	c)	Is the relation R an equivalence relation? If yes, explain why. If not, explain which properties are not satisfied.		
2.	*a)*	A function $f: A \rightarrow B$ is defined by the mapping: A = {1, 2, 3, 4} B = {a, b, c, d, e} f = {(1, a), (2, b), (3, b), (4, d)} **Analyze** the function with your understanding, and find out the following: i) Domain ii) Co-Domain iii) Range iv) Image v) Preimages	[Marks-5]	CLO-3 *Level-4*
	b)	Suppose f: R → R, f(x) = x+1-7+8. **Analyze** the function, then classify it and justify your answer (the classification may come under multiple types at the same time).	[Marks-5]	
3.		Consider the following hierarchy in a research institute: Dr. Apurba is the Director of the institute. The Director **has two Department Chairs** under him: Dr. Purbomita and Dr. Nipa. Dr. Purbomita **has two Research Supervisors**: Prof. Namira, Prof. Samira. Prof. Namira **has two Research Assistants**: Ms. Shoa and Mr. Arif. Prof. Samira **has two Research Assistants**: Mahir and Mim. Dr. Nipa **has two Research Supervisors**: Prof. Shibly, Prof. Rayhan. Prof. Shibly **has two Research Assistants**: Ms. Tarin and Mueen. Prof. Rayhan **has two Research Assistants**: Mr. Nirob, Ms. Khushi.	[Marks-10]	CLO-4 *Level-5*

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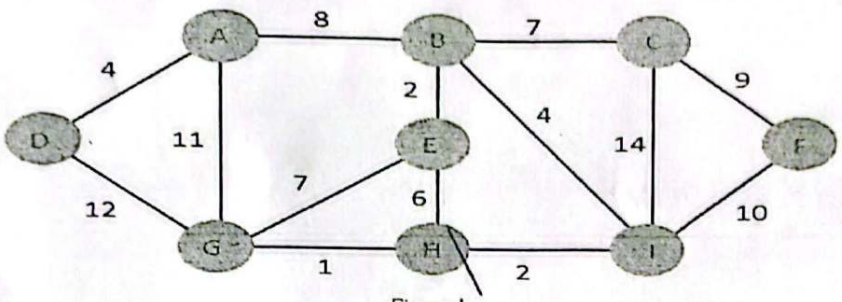
	a)	**Summarize** Complete Binary Tree.		
	b)	Assess pre-order, in-order, and post-order traversals for the tree.		
	c)	**Evaluate** the academic hierarchy from the above scenario and draw the hierarchy tree.		
4.		Use the Dijkstra algorithm to find the shortest path and show each steps in detail.  *Figure 1*	**[Marks-10]**	**CLO-4** ***Level-5***

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