

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

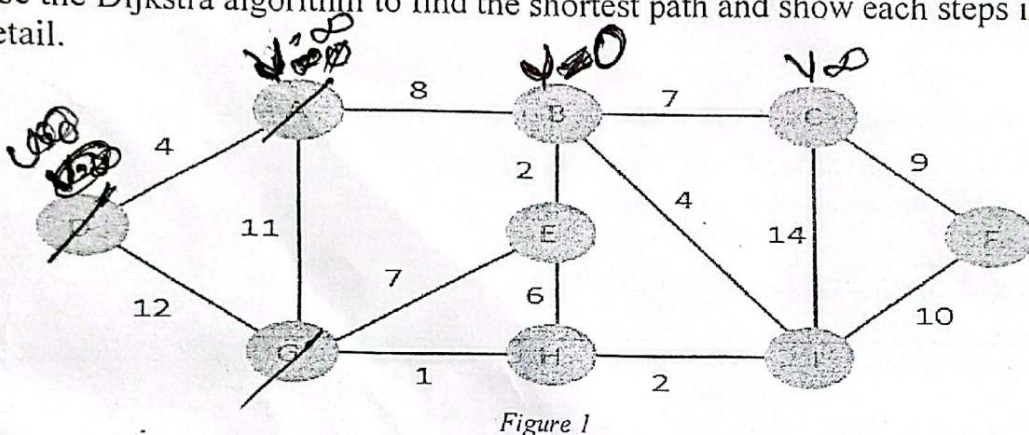
Marks: 40

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, $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (3, 1)\}$.		
	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.	[Marks-3+4+3]	CLO-3 Level-4
	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 $f: R \rightarrow R$, $f(x) = x+1-7+8$. 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

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.		
	Use the Dijkstra algorithm to find the shortest path and show each steps in detail.	[Marks-10]	CLO-4 Level-5



$A \rightarrow H$

$G \leftarrow H \leftarrow I \leftarrow B \leftarrow A$

$A \leftarrow G \leftarrow H \leftarrow I$

$C \rightarrow G$

$A \rightarrow G \leftarrow H$

$A \leftarrow G \leftarrow E$

$A \leftarrow G$

$A \rightarrow C$