



# Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Summer 2025

Course Code: SE123; Course Title: Discrete Mathematics

Sections & Teachers: All

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.	<p>Analyze the following set <math>X</math> and relation <math>R</math> provided below:  <math>X = \{1, 2, 3, 4\}</math> and <math>R = \{(1, 1), (1, 2), (2, 1), (2, 3), (3, 3), (3, 4)\}</math>.</p> <p>a) Determine if the relation <math>R</math> is reflexive, symmetric, and transitive.</p> <p>b) Graphically express the relation using a directed graph, a tabular array, and an arrow graph.</p> <p>c) Is the relation <math>R</math> an equivalence relation? If yes, explain why. If not, explain which properties are not satisfied.</p>	[Marks-3+4+3]	CLO-3 Level-4
2.	<p>a) Analyze the diagram with your understanding of function, and find out the following:</p> <ol style="list-style-type: none"> <li>Domain</li> <li>Range</li> <li>Co-Domain</li> <li>Image</li> <li>Preimages</li> </ol> <div> <p>Figure 1</p> </div>	[Marks-5]	CLO-3 Level-4
	<p>b) Suppose <math>f: \mathbb{R} \rightarrow \mathbb{R}</math>, <math>f(x) = x+1</math>. Analyze the function, then classify it and justify your answer (the classification may come under multiple types at the same time).</p>	[Marks-5]	

3.	<p>Evaluate the following hierarchy of University Course Prerequisites. In a university:</p> <ul style="list-style-type: none"> <li>Main course: Computer Science <ul style="list-style-type: none"> <li>Two prerequisites: Programming (P) and Mathematics (M)</li> <li>Programming has two sub-courses: Data Structures (DS) and Algorithms (Algo)</li> <li>Mathematics has one sub-course: Statistics (Stats)</li> <li>Algorithms have two sub-topics: Graph Theory (GT) and Dynamic Programming (DP)</li> </ul> </li> </ul> <p>a) Sketch the tree structure of course dependencies.  b) Determine the Pre-order, In-order, and Post-order traversal sequences.  c) Justify the tree as a Full Binary tree</p>	[Marks- 2+6+2]	CLO-4 Level-5
4.	<p>Evaluate the characteristics of the graphs illustrated in Figure 2. Redraw the graphs in your script and use proper identifiers. Categorize them into isomorphic and non-isomorphic categories. Finally, justify your categorization using an appropriate concept of graph theory.</p> <div style="text-align: center;"> <p>Figure 2</p> </div>	[Marks-10]	CLO-4 Level-5

$$\frac{0+2}{0}$$

$$f(m) = f(n_2) \dots$$