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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Mid Examination, Summer 2025
Course Code: CSE212, Course Title: Discrete Mathematics
Level: 2 Term: 1 Batch: 67

Time: 01:30 Hrs **Marks: 25**

Answer ALL the 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.	**Apply** the laws of logical equivalences to prove that the following statements are equivalent. $[(\neg p \rightarrow q) \wedge (q \rightarrow (p \wedge r))] \equiv [p \wedge (q \rightarrow r)]$	[5]	CO1
2.	**Apply** the rules of inference to prove whether the argument is valid or not. If Alex accessed the server without permission, then either Alex used someone else's credentials or bypassed the firewall. If Alex did not violate the identity policy, then Alex did not use someone else's credentials. If Alex bypassed the firewall, then Alex violated the network policy. Alex did not violate the identity policy. Alex accessed the server without permission. Therefore, Alex violated the network policy.	[5]	
3.	a) **Transform** the following statement in English, shown with the help of predicates and quantifiers. M(x): "x is a movie" P(y): "y is a person" L(y, x): "y likes x" $\exists x \, \forall y[M(x) \wedge (P(y) \rightarrow L(y, x))]$	[2]	
	b) **Express** the following statement in formal logic using predicates and quantifiers. "Every natural number greater than 2 has at least one even proper divisor."	[3]	
4.	At a university, students can join the Cultural Club, Cyber Security Club, or Computer Programming Club. In a given semester, 84 students joined Cultural Club, 76 joined Cyber Security Club, 64 joined Computer Programming Club, 34 joined both Cultural and Cyber Security Club, 29 joined both Cultural and Computer Programming Club, 24 joined both Cyber Security and Computer Programming Club, 15 students joined all three clubs, 12 students joined none of the clubs. **Find** the following from the information given above. i. Determine the number of students who joined the Cyber Security Club only. ii. Calculate the total number of students surveyed	[5]	CO2
5.	**Determine** the type of each function (One-to-One, Onto, or One-to-One Correspondence) defined as $f: \mathbb{R} \rightarrow \mathbb{R}$ i. $f(x) = 3x+5$ ii. $f(x) = \frac{1}{x^2+1}$	[5]	