Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Midterm Examination, Spring2026

Course Code: CSE212 **Course Title: Discrete Mathematics**
Level: 2 **Term:1** **Batch: 68**

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

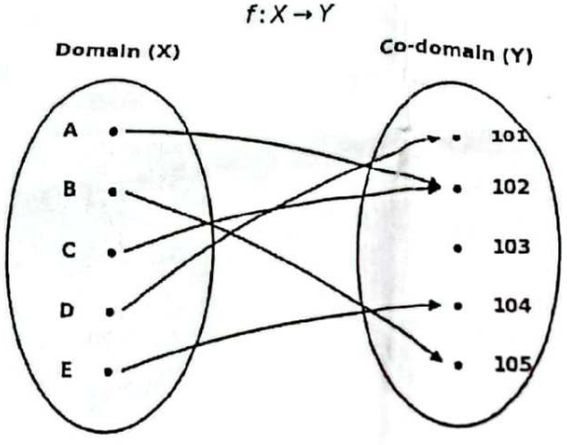
Answer ALL Questions

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

1.	*a)*	Implies the converse, inverse, and contrapositive of the following conditional statement in English. "If a printer senses that you are in a hurry, then it will intentionally jam itself."	3	CO1
	b)	Represent the following statement using predicates and quantifiers. "The product of any real number and any integer is a real number."	2	
2.	*a)*	Apply the laws of logical equivalences to prove whether the following logical expression is logically equivalent or not. $\neg(p \vee \neg q) \vee (\neg p \wedge \neg q) \vee (p \wedge q) \equiv p \rightarrow q$	5	CO1
3.	*a)*	In the T20 World Cup group stage, the following conditions are met. If Bangladesh beats Pakistan (P) and India beats Pakistan (Q), then Pakistan is eliminated from the tournament (R). If Pakistan is eliminated (R) the group standings are finalized (S). Once the standings are finalized (S), the points table implies that either Bangladesh qualifies for the semi-finals (T) or India qualifies (U). However, due to the specific Net Run Rate breakdown, if Bangladesh qualifies (T), then India cannot qualify (¬U). Bangladesh has successfully defeated Pakistan (P). India has also defeated Pakistan (Q). Therefore, can we logically conclude that India fails to qualify for the semi-finals (¬U)? Determine whether the above argument is valid or invalid. If the argument is valid, prove the conclusion using appropriate rules of inference. If the argument is invalid, identify precisely where the reasoning fails.	5	CO1
4.	*a)*	Let, A={1,2,3….,m}, B={1,2,3,…,n}, prove whether $\lvert P(A \times B)\rvert = \lvert P(A) \times P(B)\rvert$	2	CO2
	b)	A university conducted a survey among 100 students to study their participation in three extracurricular activities: A: Students who participate in Sports B: Students who participate in Music C: Students who participate in Debate The survey revealed the following information: 60 students participate in Sports. 55 students participate in Music. 50 students participate in Debate.	3	

30 students participate in both Sports and Music.
25 students participate in both Music and Debate.
20 students participate in both Sports and Debate.
10 students participate in all three activities.
How many students participate in exactly two activities?

5.	a)	Illustrate the inverse of the following function, if it is invertible. Otherwise, provide the reason why it is not.	2	CO2



	b)	Explore the invertibility of the following function and determine its inverse, if it exists. Otherwise, provide the reason why it is not invertible. $f: \mathbb{N} \to \mathbb{N}$ with the rule $f(x) = 5x + 7$	3	