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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Midterm Examination, Fall 2024

Course Code: CSE212 Course Title: Discrete Mathematics

Level: 2 Term:1 Batch: 65

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)*	Translate the following statement using predicates, quantifiers, and logical connectives when the domain of discourse consists of all positive integer numbers. Use E(x) for "x is even" and O(x) for "x is odd." (a) No number is both even and odd. (b) One more than any even number is an odd number. (c) There is exactly a prime number that is even. (d) Between any two numbers there is a third number. (e) There is no number between a number and one more than that number.	**5**	**CO1**
2.	*a)*	Let p, q, and r represent the following propositions: p: There is no rain in the forecast. q: The hiking path is clear of debris. r: The river along the trail is safe to cross. Write these propositions using p, q, and r and logical connectives (including negations): i. It is safe to cross the river if and only if there is no rain in the forecast and the hiking path is clear of debris. ii. For it to be safe to hike, it is necessary that there is no rain and the hiking path is clear, but it is sufficient that either the river is safe to cross or there is no rain.	**2.5**	**CO1**
	b)	Apply laws of logical equivalences to prove whether the following logical expression is logically equivalent or not. [Using rules] $\neg (p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q$	**2.5**	
3.	*a)*	If Alice studies hard, she will pass the exam. If Alice passes the exam, she will get a scholarship. If Alice gets a scholarship, she will travel abroad or move to a new city. If Alice does not move to a new city, she will not travel abroad. Alice did not move to a new city. Therefore, Alice did not study hard. Is the argument valid?	**5**	**CO1**

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4.	***a)***	Let, x belong to positive integers. A, B, and C are the sets expressed with the following set building notations. A = {x | x is prime number not exceeding 15} B = {x | x is positive odd integer not exceeding 15} C = {x | x is positive integers not exceeding 15 and divided by both 2 and 3} Now, assume that D = {Set of the digits of your ID} 1. Draw a Venn diagram representing A, B, C and D. 2. $\{B \cap C\} \times D = ?$ 3. $P(B \cap D) = ?$ Note: If your Id is: 203-15-4678 then D = {2, 0, 3, 1, 5, 4, 6, 7, 8}. If there is any repetitive value in your ID, discard the second periodic value. For example, if your id is: 203-15-1525 then D = {2, 0, 3, 1, 5}.	**3**	**CO2**
	b)	Find the following cardinalities: i. $\|A\|$ when $A = \{ x \in Z : -2 \leq x \leq 100 \}$ ii. $\|A \cap B\|$ when $A = \{ x \in N : x \leq 20 \}$ and $B = \{ x \in N : x \text{ is prime} \}$	**2**	
5.	***a)***	Find out the image, pre-image, domain & codomain of the following function, $f(x,y) = 2xy+x^2y^2$ Where $x = \{1,2,3\}$ & $y = \{5,6\}$	**3**	**CO2**
	b)	Let f be the function from {a, b, c, d} to {1, 2, 3} defined by f (a) = 3, f (b) = 2, f (c) = 1, and f (d) = 3. Is f an onto function? Explain the answer on your own.	**2**	