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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid Examination, Spring 2025

Course Code: CSE212, Course Title: Discrete Mathematics

Level: 2 Term: 1 Batch: 66

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 rules of Inferences to prove whether the argument is valid or not. If the AI system is fully trained, then it will pass the Turing test. If the AI system does not pass the Turing test, then it needs further optimization. If the AI system is either untrained or needs further optimization, then it will not be deployed. The AI system is fully trained and has high computational power. If the AI system is deployed, then it will improve efficiency in automated customer service. Either the AI system is deployed, or the company will switch to a different project. The company will not switch to a different project. Therefore, the AI system will improve efficiency in automated customer service. Make sure you have mention all the necessary propositions and premises.	[5]	CO1
2.	*a)*	Translate the following statement in English, shown with the help of predicates and quantifiers. C(x): "x is a Computer Science major" M(y): "y is a math course" T (x, y): "x is taking y" where x represents students and y represents courses: $\forall x \exists y (C(x) \rightarrow M(y) \wedge T(x, y))$.	[3]	CO1
	b)	Construct an equivalent statement of $p \rightarrow (\neg q \wedge r)$ using only $\wedge$, $\vee$ *and* $\neg$ connectives.	[2]	
3.	*a)*	Apply rules of logical equivalences to show that the propositions $\neg\left(p \vee \left((q \rightarrow r) \wedge r\right)\right) \vee s$ and $r \rightarrow s$ are logically equivalent.	[3]	CO1
	b)	Let *S(x)* be the predicate "*x* is a student," *F (x)* the predicate "*x* is a faculty member," and *A(x, y)* the predicate "*x* has asked *y* a question," where the domain consists of all people associated DIU. Use quantifiers to translate the following statements: i) Some students have asked every faculty member a question. ii) Some students have never been asked a question by a faculty member.	[2]	
4.	*a)*	Determine the type of the function from R to R: i) $f(x) = \frac{x^2+1}{x^2+1}$ ii) $f(x) = x^3 - 3$	[3]	CO2
	b)	If S={a,{∅}} then determine whether the following statements are true or false: {a, {∅},{{∅}}}∈ P(P(S)). ii) {{∅},{{∅}}} ∉ P(P(S)).	[2]	
5.	*a)*	In a company of 728 employees, every employee participates in at least one of three training programs: Leadership Training (L), Technical Skills Training (T), and Communication Skills Training (C). A survey found that: 52% of employees attended Leadership Training. 64% of employees attended Technical Skills Training. 58% of employees attended Communication Skills Training. 30% attended both Leadership and Technical Skills Training. 35% attended both Technical Skills and Communication Skills Training. 33% attended both Leadership and Communication Skills Training. 15% attended all three training programs. Find the number of employees who attended exactly two of the training programs and show the sets in a Venn diagram.	[3]	CO2
	b)	Let $A_i = \{\ldots\ldots, -2, -1, 0, 1, 2, \ldots, i\}$ where i belongs to positive integer. Find: i) $\bigcup_{i=1}^{n} A_i$ ii) $\bigcap_{i=1}^{n} A_i$	[2]	