Daffodil International University
Faculty of Science & Information Technology
Department of Computer Science and Engineering
Mid Semester Examination, Spring-2025
Course Code: BNS101   Course Title: Bangladesh Studies
Level: 2   Term: 1   Batch: 66

Exam Duration: 1.5 Hours

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.	Bangladesh is the largest delta in the world formed by the Ganges, Brahmaputra, and Meghna rivers. **Infer** the pros and cons of Bangladesh being the largest delta in the world. The digital divide, exacerbated by uneven access to technology and the internet, has created new socio-cultural disparities in Bangladesh. **Explain** how the digital divide brings fragmentation in the socio-cultural landscape of Bangladesh with suitable examples.	10	CO1
2.	Following the mass uprise of July 2024, Bangladesh has adopted a dual strategy of internal reconciliation and proactive diplomacy to restore its global image. **Identify** the strategic stance of contemporary Bangladesh on upholding her national prestige in the international arena following the aftermath of July 2024's mass uprise.	5	CO1
3.	Bangla language, with its rich literary heritage, has been shaped by diverse groups over centuries. **Illustrate** the contribution of various groups of people in enriching the Bangla language.	5	CO2
4.	Bangladesh's Constitution has been amended 17 times since it came into effect on 16 December 1972. However, recent demands from citizens, particularly the youth, have highlighted the need for further reforms. **Recommend** any five reforms in the existing constitution of Bangladesh with proper justifications to accommodate the aspirations of the youth of Bangladesh.	5	CO2

Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Mid Examination, Spring 2025
Course Code: CSE213, Course Title: Algorithms
Level: 2 Term: 1 Batch: 66

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.]

		Marks	

1.	Analyze the complexity of the following code:
	
	a)
	`for(int i = 1; i <= n; i++) {`
	`    for(int j = 1; j <= n; j *= 2) {`
	`        int x = 5;`
	`        printf("i = %d, j = %d\n", i, j);`
	`    }`
	`}`
	`for(int i = 1; i <= n; i++) {`
	`    printf("i = %d\n", i);`
	`}`
	
	b)
	`void exampleFunction(int n) {`
	`    for (int i = 0; i < n; i++) {`
	`        for (int j = 0; j < n; j++) {`
	`            printf("*");`
	`        }`
	`    }`
	`}`
		2.5
		+
		2.5
			CO1

2.	Consider a **sorted dataset containing 1 million** unique integers, ranging from **1 to 1,000,000.** a) If you perform a **binary search** to find a randomly chosen number, how many comparisons would it take in the worst case? b) If you perform a **linear search** instead, how many comparisons would it take in the worst case? c) Given the time complexity of both algorithms, how would the performance differ if the dataset size doubled to **2 million**? d) Suppose the dataset is **unsorted**. Which search algorithm would be preferable and why? e) If the target number is found early in the list, which search method would be more efficient, and under what conditions?	05	CO2
3.	You are given an unsorted array of integers: **[4, 7, 5, 9, 1, 3, 8, 6]**. Your task is to sort this array in descending order using a divide-and-conquer sorting algorithm. Additionally, you must ensure that the algorithm does not use any extra memory (i.e., it sorts in place) and **display the intermediate steps** of the sorting process as the array is sorted to help demonstrate how the algorithm works.	05	CO2
4.	Given the message: **khokakhokikhokamaniratakecare** Construct a Huffman tree, assign variable-length codes, and encode the message. Compute the total bits required.	05	CO3

| 5. | Imagine you're packing for a weekend trip, and you have a limited amount of space in your backpack. You have **6 items** to choose from, and each item has a **weight** (how much space it takes up in your backpack) and a **value** (how important or useful it is for your trip). You want to pack the most valuable combination of items, but your backpack has a weight limit of **11 kg**. | 05 | CO3 |

You can either take an item with you or leave it behind, but you can't take the same item more than once. Find the most valuable combination of items from the following list and mentioned the name of the items.

Product	Weight	Value
Book	2	3
Camera	3	4
Pair of shoes	4	5
Jacket	5	6
Portable charger	6	7
Blanket	7	8

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: $\forall x \exists y \, (C(x) \to M(y) \land T(x, y))$.	[3] CO1
	b)	Construct an equivalent statement of $p \to (\neg q \land r)$ using only $\land$, $\lor$ and $\neg$ connectives.	[2]
3.	a)	Apply rules of logical equivalences to show that the propositions $\neg\left(p \lor ((q \to r) \land r)\right) \lor s$ and $r \to s$ 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 $S=\{a,\{\emptyset\}\}$ then determine whether the following statements are true or false: $\{a, \{\emptyset\}, \{\{\emptyset\}\}\} \in P(P(S))$. ii) $\{\{\emptyset\}, \{\{\emptyset\}\}\} \in P(P(S))$.	[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]

Daffodil International University
Faculty of Science & Information Technology
Department of Computer Science and Engineering
Mid Examination, Spring 2025
Course Code: MAT211, Course Title: Engineering Mathematics
Level: L2   Term: T1   Batch: 66

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)	Explain the order and degree of a differential equation with examples.	[2]	
	b)	Outline an ODE corresponding to the function: $y = Pe^{3x} + Qe^{2x} + Re^{-x}$.	[4]	CO1
	c)	Interpret the solution to the Linear ODE: $x^2 \frac{dy}{dx} + 2xy = x^2 e^{2x}$.	[4]	
2.	a)	Solve the homogeneous first order first degree ODE: $y^2 dx - (xy + x^2) dy = 0$.	[4]	CO2
	b)	Solve the higher order ODE: $D^4 y + 2D^3 y + 8Dy + 16y = e^{-2x} + \sin 2x$.	[6]	
3.		Solve the following higher order ordinary differential equation (ODE) with constant coefficients $D^2 y + 3Dy + 2y = f(x)$ where the function $f(x) = e^{2x} \sin^2 3x$.	[5]	CO2