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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Midterm Examination, Spring 2026

Course Code: SE214; Course Title: Algorithm Design and Analysis

Sections & Teachers: SA(A,B,C), IS(D,H), FE(E,F,G), MMSI(I,J), SSI(K,L),AF(M,N),AG(O)

Time: 1 Hour 30 Mins **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)	**Analyze** the time complexity of given code by calculating the operations it will require.
		
		for (i =1 ; i <=n; i=i*5){ →logn+1
		printf ("Hello, How is going your exam"); logn×1
		}
			[Marks-2]	CLO-1 *Level-4*

	b)	Analyze the time complexity of Quick Sort Algorithm in Worst and Best Case Scenario.	[Marks-3]	
2.	a)	You are developing software for a **library inventory system**. The system receives the following book ID numbers according to your course code in random order: [532, 235, 217, 215, 214, 216] 0 1 2 3 4 5 To organize them, the system repeatedly performs these steps: • It scans the entire list to find the smallest ID • Moves that ID to the **first unsorted position** • Repeats this process for the remaining unsorted IDs until the list is fully arranged After arranging apply your best known search algorithm to find the **Algorithm Theory** course book ID **Demonstrate** the overall step-by-step process.	[Marks- 8]	CLO-2 *Level-2*

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	b)	An integer sequence **[54, 95, 89, X, 27, 66, 38, 12]** is provided, where the value of **X** is determined by the expression $$X = -\left(\frac{2P+10}{2} + P\right)$$ Here, **P represents the last two digits of your student ID.** Determine a suitable divide-and-conquer based sorting strategy that rearranges the elements into ascending order, while ensuring that the algorithm does not use any additional memory. **Visualize** the steps of the sorting process to clearly demonstrate how the algorithm transforms the array into a sorted sequence.	**[Marks-7]**	
3.	a)	A teacher records the marks of **nine students** in the order they submitted their assignments: • Student A: **34** • Student B: **12** • Student C: **45** • Student D: **20** • Student E: **8** • Student F: **30** • Student G: **25** • Student H: **40** • Student I: **15** The teacher chooses a sorting strategy that recursively splits the list into two halves, continues dividing until each sublist contains a single value, and then combines the sublists by repeatedly comparing the elements of each sublist. The goal is to arrange the marks so that higher marks appear before lower marks. From the above scenario, construct the initial array in the given order. Based on your observation, **identify** the most suitable sorting algorithm for this problem, then **break down and trace** each recursive division step using a clear diagram, and **illustrate** how the sublists are combined. Finally, **compare** the worst-case efficiency of the chosen algorithm with other possible algorithms.	**[Marks-5]**	**CLO-3** ***Level-4***