



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.]

1.	Analyze the complexity of the following code:	Marks	CO1
	<p>a)</p> <pre>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); } }</pre> <p>for(int i = 1; i <= n; i++) { printf("i = %d\n", i); }</p> <p>b)</p> <pre>void exampleFunction(int n) { for (int i = 0; i < n; i++) { for (int j = 0; j < n; j++) { printf("*"); } } }</pre>	<p>2.5 + 2.5</p>	
2.	<p>Consider a sorted dataset containing 1 million unique integers, ranging from 1 to 1,000,000.</p> <p>a) If you perform a binary search to find a randomly chosen number, how many comparisons would it take in the worst case?</p> <p>b) If you perform a linear search instead, how many comparisons would it take in the worst case?</p> <p>c) Given the time complexity of both algorithms, how would the performance differ if the dataset size doubled to 2 million?</p> <p>d) Suppose the dataset is unsorted. Which search algorithm would be preferable and why?</p> <p>e) If the target number is found early in the list, which search method would be more efficient, and under what conditions?</p>	05	CO2
3.	<p>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.</p>	05	CO2
4.	<p>Given the message: khokakhokikhokamaniratakecare Construct a Huffman tree, assign variable-length codes, and encode the message. Compute the total bits required.</p>	05	CO3

5.	<p>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.</p> <p>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.</p>	05	CO3																					
<table border="1"><thead><tr><th data-bbox="227 462 584 504">Product</th><th data-bbox="584 462 925 504">Weight</th><th data-bbox="925 462 1250 504">Value</th></tr></thead><tbody><tr><td data-bbox="227 504 584 546">Book</td><td data-bbox="584 504 925 546">2</td><td data-bbox="925 504 1250 546">3</td></tr><tr><td data-bbox="227 546 584 588">Camera</td><td data-bbox="584 546 925 588">3</td><td data-bbox="925 546 1250 588">4</td></tr><tr><td data-bbox="227 588 584 630">Pair of shoes</td><td data-bbox="584 588 925 630">4</td><td data-bbox="925 588 1250 630">5</td></tr><tr><td data-bbox="227 630 584 672">Jacket</td><td data-bbox="584 630 925 672">5</td><td data-bbox="925 630 1250 672">6</td></tr><tr><td data-bbox="227 672 584 714">Portable charger</td><td data-bbox="584 672 925 714">6</td><td data-bbox="925 672 1250 714">7</td></tr><tr><td data-bbox="227 714 584 726">Blanket</td><td data-bbox="584 714 925 726">7</td><td data-bbox="925 714 1250 726">8</td></tr></tbody></table>				Product	Weight	Value	Book	2	3	Camera	3	4	Pair of shoes	4	5	Jacket	5	6	Portable charger	6	7	Blanket	7	8
Product	Weight	Value																						
Book	2	3																						
Camera	3	4																						
Pair of shoes	4	5																						
Jacket	5	6																						
Portable charger	6	7																						
Blanket	7	8																						