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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Examination, Fall 2025
Course Code: CSE123, Course Title: Data Structure
Level: 1 Term: 3 Batch: 68

Time: 02:00 Hrs **Marks: 40**

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 logistics company is redesigning its backend system to handle unique package IDs more efficiently. To improve search, insertion, and deletion operations, the engineers decide to store **all unique package IDs** in a specially organized tree structure where each ID follows a specific ordering rule. The company has provided the following unique package IDs: **(45, 12, 78, 34, 56, 90, 23, 67)**		
	a)	Write a C program to create the tree from the given data elements and display all the package IDs in **ascending order** based on the tree's ordering property.	4	
	b)	Write a function (**deleteID**) to delete a specific package ID from the tree.	4	**CO2**
	c)	The logistics company discovers that **56 package IDs** was mistakenly inserted into the tree. Now write a C function to **update** the incorrect package ID (**replace 56 with 65**) while maintaining the tree's ordering property.	4	
2.		A tech company is testing a self-balancing data structure for fast searching and provides the following unique integers to be stored in a tree: **(40, 20, 60, 10, 30, 50, 70, 25, 60, 55)**		**CO3**
	a)	Construct the tree step-by-step after inserting all the elements in the given order, clearly showing self-balancing wherever they occur.	5	
	b)	Draw the updated tree after deleting the element 30 while maintaining height balance.	3	
3.		A ride-sharing company is developing a priority system to always identify the driver with the **highest rating** during peak hours. To efficiently process the ratings, the system stores them in a **Heap**, where the **highest-rated** driver is always at the **top**. You are given the following unique driver ratings: **(42, 15, 88, 27, 63, 51, 90, 33)**		
	a)	Build the Heap step-by-step after inserting all driver ratings in the given order.	4	**CO3**
	b)	Show the inorder, preorder and postorder of **Q3(a)** heap.	3	
	c)	Draw the updated Heap after deleting the highest-rated driver from the heap.	3	
4.		A city transit authority is designing a routing aid for commuters on a small metro network. Stations: **Central (C), North (N), East (E), South (S), West (W), Park (P), Hill (H), Market (M), River (R), Harbor (B).** Directed edges (unweighted): C → N, C → W, C → E, N → P, W → P, E → H, E → M, P → H, H → B, M → R, R → B, P → R.		

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	a)	Construct the **directed graph** (clearly label all nodes and edges) and show the corresponding **adjacency matrix.**	**4**	**CO3**
	b)	Show the step-by-step procedure for finding the shortest path from **Central (C)** to **Harbor (B)** using either **BFS or DFS** and justify your choosing technique.	**6**	

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