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Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Spring 2025

Course Code: CSE123, Course Title: Data Structures

Level:1 Term:2 Batch: ALL

Time: 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.		**a)** Explain the concept of a self-referential structure in C. Provide an example.	**3**	**CO1**
		b) Write necessary code using **C language** to implement a **Linear Linked List** with the following operations: 1. **Insert at End** 2. **Delete from Beginning** 3. **Display the List** **Requirements:** • Define node containing *data* (int) and a *pointer* (self referential). • Use dynamic memory allocation (malloc and free) for node creation and deletion. • Provide reasoning for using a linked list in applications like data storage for Library. (*Full correct implementation: 7 marks, Partial correctness: 4-5 marks, Minor issues: 2-3 marks*)	**7**	**CO2**
2.		**a)** Why is dynamic memory allocation preferred when implementing linked lists? Explain with an example.	**2**	**CO1**
		b) Implement a **Stack** using a **Linked List** in C with the following operations: 1. **Push** (Insert an element) 2. **Pop** (Remove the top element) 3. **Peek** (View the top element) 4. **isEmpty** (Check if the stack is empty) **Requirements:** • Explain the time complexity of each operation.	**8**	**CO2**

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		• Provide appropriate output for sample inputs. *(Full correct implementation: 8 marks, Partial correctness: 5-6 marks, Minor issues: 3-4 marks)*		
3.		**Problem Solving (Analysis & Synthesis Level)** **Problem Scenario:** A printer management system requires efficient handling of print jobs. Each print job has a priority value. The system should process: • **High-priority jobs** immediately (Stack behavior: LIFO). • **Normal jobs** in the order they were received (Queue behavior: FIFO). **Task:** 1. Propose a **combination of Stack and Queue** to design this system. 2. Draw a **flowchart or diagram** to represent the process. 3. Explain how the system handles multiple job requests with varying priorities. *(Solution approach: 3 marks, Diagram: 1 mark, Explanation: 1 mark)*	**5**	**CO2**

Good Luck