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.]*

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| 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:<br><br>1. **Insert** at **End**<br>2. **Delete** from **Beginning**<br>3. **Display** the **List**<br><br>**Requirements:**<br><br>• Define node containing *data* (int) and a *pointer* (self referential).<br>• Use dynamic memory allocation (malloc and free) for node creation and deletion.<br>• Provide reasoning for using a linked list in applications like data storage for Library.<br><br>(*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:<br><br>1. **Push** (Insert an element)<br>2. **Pop** (Remove the top element)<br>3. **Peek** (View the top element)<br>4. **isEmpty** (Check if the stack is empty)<br><br>**Requirements:**<br><br>• Explain the time complexity of each operation. | 8 | CO2 |



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

*Good Luck*