

**UNIVERSITY OF CALOOCAN CITY**

**COMPUTER ENGINEERING DEPARTMENT**

Data Structure and Algorithm

**LINKED LIST SEATWORK**

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**1. What is a singly linked list, and how does it differ from an array?**

-A singly linked list is a linear data structure made up of nodes, where each node stores data and a pointer to the next node, allowing traversal in only one direction. Unlike arrays, which store elements in contiguous memory locations and provide O(1) random access via indexing, singly linked lists require sequential traversal for access, resulting in O(n) time. However, linked lists allow efficient insertions and deletions without shifting elements, while arrays incur higher costs for these operations when performed in the middle of the sequence.

**2. When would you prefer a linked list over an array, and vice versa?**

-Linked lists are preferred when frequent insertions or deletions are required, particularly in the middle or at the start, or when the size of the dataset changes dynamically. They can perform these operations in O(1) time if the pointer to the position is known. Arrays, on the other hand, are preferable when fast random access is needed, the data size is fixed or predictable, and cache efficiency is a priority due to contiguous memory storage.

**3. How are linked lists used in real-world applications (e.g., browser history, undo**

**functionality)?**

-In real-world applications, linked lists are used in scenarios that require dynamic data handling without contiguous memory allocation. In browser history, a doubly linked list stores visited pages, enabling efficient navigation forward and backward. In text editors, undo and redo functionalities rely on linked lists to move between states efficiently. They are also applied in implementing queues, stacks, graph adjacency lists, hash table chaining, and memory management systems where flexible insertion, deletion, and traversal are important.

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