| ASSIGNMENT | |
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| Singly Linked List | |
| **Course Code:** CPE201L | **Program:** BSCPE |
| **Course Title:** Data Structure and Algorithm | **Date Performed:** 8/11/2025 |
| **Section:** 2A | **Date Submitted:** 8/15/2025 |
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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 composed of nodes, where each node contains two parts: the data itself and a pointer that refers to the next node in the sequence. Unlike arrays, which store elements in contiguous memory locations and allow direct indexing, a singly linked list stores its elements in separate memory locations connected through pointers. This makes linked lists more flexible in terms of memory allocation since they can easily grow or shrink during runtime without resizing. However, accessing a specific element in a linked list requires sequential traversal from the head node, while arrays can access elements instantly using an index.

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

A linked list is generally preferred over an array when frequent insertion or deletion of elements is required, especially in the middle of the list, or when the final number of elements is unknown and dynamic memory allocation is needed. Conversely, arrays are more suitable when fast random access is important, the number of elements is fixed, and the data is accessed more often than it is modified. In such cases, arrays offer better performance and do not require extra memory for pointers.

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 various scenarios. For instance, browser history navigation often uses linked lists to store visited web pages, allowing users to move forward or backward between them. Text editors implement undo functionality by storing each change as a node, enabling step-by-step reversal of actions. Music playlists can also be implemented using linked lists, allowing songs to be dynamically inserted, deleted, or rearranged. Additionally, linked lists are applied in memory management systems for allocating and freeing memory blocks efficiently.

4. Cite your references
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