Data Structure Assignment – Theoretical Question

Question:
What are the differences between Singly Linked List, Circular Linked List, and Doubly Linked List in terms of: Uses Pros Cons **1. Singly Linked List Uses:**
- Used when memory is limited.
- Suitable for simple dynamic data storage.
- Used in stacks, queues, and adjacency lists.

Pros:
- Requires less memory than doubly linked list.
- Easy to implement.- Dynamic size.

Cons:
- Traversal is only in one direction.
- Deleting a node requires access to the previous node.- Reverse traversal is not possible.

2. Circular Linked List
Uses:
- Used in applications that require continuous looping (e.g., CPU scheduling).
- Useful for implementing circular queues.

Pros:
- No NULL pointers; last node points to the first node.
- Efficient traversal starting from any node.- Suitable for round-robin algorithms.

Cons:
- More complex implementation than singly linked list.
- Risk of infinite loops if not handled carefully.- Harder to debug.

3. Doubly Linked List
Uses:
- Used in navigation systems (back and forward).
- Used in undo/redo operations.
- Useful when bidirectional traversal is required.

Pros:
- Traversal is possible in both directions.
- Deletion is easier since previous node is known.- More flexible than singly linked list.

Cons:
- Requires more memory due to extra pointer.
- More complex implementation.
- Slightly slower due to extra operations.

Conclusion:
Each linked list type has its own advantages and disadvantages. The choice depends on the application requirements, memory usage, and traversal needs.
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