DSA Assignment 1

Comparison of Linked Lists and Dynamic Arrays

1. Time Complexity of Each Method

Operation	Singly Linked List	Dynamic Array
Insert at index	O(n)	O(n)
Delete at index	O(n)	O(n)
Get size	O(1)	O(1)
Is empty	O(1)	O(1)
Rotate right by k	O(n)	O(n)
Reverse	O(n)	O(n)A
Append	O(1)	O(1)
Prepend	O(1)	O(n)
Merge	O(1)	O(n)
Interleave	O(n)	O(n)
Find Middle	O(n)	O(1)
Index of element	O(n)	O(n)
Split at index	O(n)	O(n)
Resize	—	O(n)

2. Space Complexity of Each Method

Operation	Singly Linked List	Dynamic Array
Insert at index	O(1)	O(1)
Delete at index	O(1)	O(1)
Get size	O(1)	O(1)
Is empty	O(1)	O(1)
Rotate right by k	O(1)	O(1)
Reverse	O(1)	O(1)

Append	O(1)	O(1)
Prepend	O(1)	O(n)
Merge	O(1)	O(n)
Interleave	O(1)	O(n)
Find middle	O(1)	O(1)
Index of element	O(1)	O(1)
Split at index	O(1)	O(n)
Resize (custom factor)	—	O(n)

3. Advantages and Disadvantages

Linked List

Advantages:

1. Dynamic Size
2. Efficient Insertions/Deletions
3. No wasted space

Disadvantages:

1. Slow Access
2. Memory Overhead
3. Cache Performance

Dynamic Arrays

Advantages:

1. Fast Access
2. Efficient Iteration
3. Memory Efficiency

Disadvantages:

1. Resize Overheard
2. Insert/Delete Costs
3. Pre-allocated space