



303105201 - Design of Data Structures

Academic Year - 2024-2025 – Sem-3

ASSIGNMENT-2

(Based on Unit-3 & 4)

Submission Date – Latest by 30-August-2024

SR.No	Question
1.	Write an algorithm to perform each of the following operations on singly linked list using head/first or start node. 1. add node at the end 2. insert a node containing x data after node having address p
2.	Differentiate array and linked list and write an algorithm for deleting a last node from doubly Linked list.
3.	Write an algorithm to perform each of the following operations on Circular linked list using head/first or start node. 1. add node at the start 2. add node at the end
4.	Write an algorithm or a function to search a node in singly link list.
5.	Apply selection sort algorithm on following input. 12, 29, 25, 8, 32, 17 , 40. Explain step by step.
6.	Write an algorithm for bubble sort. Apply it on random 8 input data.
7.	Write Merge Sort algorithm. Apply the algorithm to the following elements: 10,5,28, 7, 39, 310, 55,15,1
8.	Why time complexity of Binary search is $O(\log n)$?
9.	The Worst case complexity of Bubble sort algorithm is A. $O(n)$ B. $O(\log n)$ B. $O(n^2)$ D. $O(n \log n)$
10.	The total number of comparisons in selection sort are (a) $O(n \log n)$ (b) $O(2n)$ (c) $O(n^2)$ (d) $O(n)$
11.	Selection sort first finds the largest element in the list and put it in the first position. TRUE OR FALSE. Justify your answer.
12.	Binary Search Complexity is $O(\log^2 n)$ in worst case. True OR False. Justify your answer.
13.	Is it possible to increase or decrease number of nodes of linked list at run time? Justify your answer.
14.	Traversal time in linked list is more compared to other linear data structure. True or False? Justify your answer.
15.	Write a C code of functions used for allocating and deallocating memory for a node in linked list.
16.	In worst case, the number of comparisons needed to search a single linked list of length n for a

	given element is (a) n (c) log n (b) n/2 (d) 2n-1
17.	What is the worst time complexity of inserting a node in a doubly linked list? A. $O(n \log n)$ B. $O(\log n)$ C. $O(n)$ D. $O(1)$

MCQ Questions:

- What is the main purpose of garbage collection in memory management?
 - To allocate memory to new processes
 - To reclaim memory that is no longer in use by the program
 - To defragment the hard drive
 - To optimize CPU usage
- In a single linked list, what happens if you try to access an element beyond the last node?
 - The program crashes
 - The program returns a null reference
 - The program throws an exception
 - The behavior is undefined
- Which of the following is a disadvantage of single linked lists over arrays?
 - Dynamic size
 - Ease of insertion/deletion
 - Random access is not allowed
 - Memory wastage due to extra space for pointers
- What is the time complexity to access an element at the n th position in a single linked list?
 - $O(1)$
 - $O(\log n)$
 - $O(n)$
 - $O(n \log n)$
- How do you delete a node from the end of a single linked list?
 - Traverse the list to find the second last node and set its next reference to null
 - Directly set the last node's next reference to null
 - Set the first node's next reference to null
 - It is not possible to delete the last node in a single linked list
- During the i th iteration of the selection sort algorithm, which of the following operations is performed?
 - The i th smallest element is placed in the i th position
 - The array is divided into two halves and merged
 - The largest element is placed in its final position
 - The array is partitioned around a pivot element
- What is the basic principle behind the bubble sort algorithm?
 - Dividing the array into subarrays and sorting them individually
 - Repeatedly swapping adjacent elements that are out of order



- C. Inserting elements into their correct position in a sorted array
 - D. Repeatedly finding the minimum element and placing it at the beginning
8. Is selection sort an in-place sorting algorithm?
- A. Yes B. No C. Only for small arrays D. Only for sorted arrays