End Term Exam

Kshetez -11020210077 - BTECH-CSE-D (DSAI) - D.S using C - CS2001

Ques 1.1

The space complexity of an algorithm or a computer program is the amount of memory space required to solve an instance of the computational problem as a function of characteristics of the input

The amt. of time taken by an algorithm to run, as a function of the length of the input is ~~It~~ called time complexity

It measures time taken to execute each statement.

* Algorithm for linar seach

```
linear search (list, value)
(1) begin
(2) for each item in list
(3)     if match item == value
(4) return the item's location
(5) end if
(6) end of for loop
(7) Exit.
```

The best case complexity →
In case linear search best case is when element is on first position of array Time complexity is O(1).

worst case →
It occurs when the element we need is at the end of array. or not in the array.
Time complexity O(n).

Ques 12

- Linked list is a linear data structure
- Elements are not stored in contiguous memory location
- It contains nodes which contains a data field & address of next node.

~~Algorithm~~ for (a)

```
Step 1: If ptr = null
            Write overflow
            Goto step 12
            end of if
```

```
step 2: Set new node = ptr
3: new node → data = val
4: set temp = head
5: set i = 0
6. Reap Repeat 5 & 6 until i
7. temp = temp → next
8. if temp = Null
   write "desired node not present"
     Goto step 12
     end of if
    End of Loop
9. Ptr → next = temp → next
10. temp → next = ptr
11. Set ptr = newnode
12. Exit
```

(b)

```
1: Start
2, Check if list is emptly or
   not
     if head == null
        print "empty" & exit
     else - goto step 3.

3. Set the head pointer to
   a temporary variable
        last = head

4, Traverse till the last node
   set while (last → next != Null)
   { increase the node count
     by 1.
     set count ++
   point to the next node in list
     set last = last → next
   }
```

~~4. Increase the value of count by 1 for last node if the list has more than 1 node otherwise the condition is applicable if the list has exactly 1 node.~~

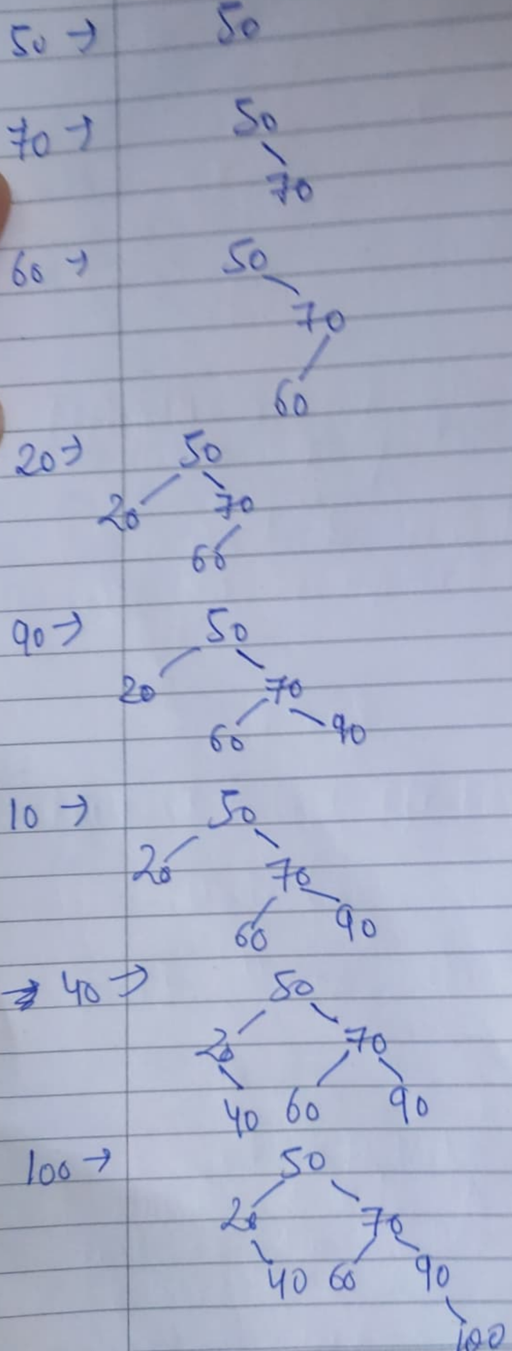
```
5. If last node has
   > 1 node then
   count + 1

6. Display count of
   nodes
   Output count
7. Stop
```

Ques 13

- BST - Binary Search Tree contains smaller value as left child & bigger as right whereas in Binary Tree this rule is not followed

Adding



- Height → 3

PART-A

Ques (1)

Notation that describe the limiting nature of a function when the argument tends towa a particular value or infinity is called Big-O notation.

For $5n^3 + 2n^2 + 3n$
→ $O(3)$

Ques (2)

Different types of data structures →

- Linear

Elements are arrange one after another. Different types of Line data structure →

1. Array 2. Queue
3. Stack 4. Linked li

- Non-linear

Elements are not arranged one after another i.e, not in sequence.

1. Graph: Vertices are connected to each other through edges

2. Trees: Only 1 edge between 2 vertices (nodes).

Ques (3)

Doubly	Singly
◦ Has data, next ~~previous~~ node address field & previous link field	◦ Has data field & address field
◦ ~~In~~ Traversal 2 ways	◦ Traversal in only 1 way

Ques (4)

To dynamically allocate memory for new node we use malloc() function.

Eg:
struct node* ptr = (struct node*) malloc (size of (Struct node))

~~Ques (8)~~

Expression	stack
234*6/+	2
34*6/+	23
4*6/+	234
*6/+	234*
6/+	212
/+	2126
+	2126
+	22

Ques (5)

ABC * D/+
234 * 6 /+

Ques 6

◦ Polish: Notation in which operator comes before operation.
Eg: (8+9) * 5

◦ Reverse polish: Notation in which operators are placed after arguments without use of operators
Eg 89 + 6 x

Ques 7

Max no. of nodes $= 2^{n+1} - 1$
$= 2^{4+1} - 1$
$= 32 - 1 = 31$

min $= n+1$
$= 4+1 = 5$

Ques 8

Application of DFS algorithm
- ☆ finding the path
- ☆ to find the strongly connected components of graphs.

Ques 9

$$T(n) = (n-1)C_1 + \frac{n(n-1)}{2} \cdot C_2 + (n-1)C_3$$
$$= an^2 + bn + c = O(n^2)$$

Ques 10

- Quick Sort is fastest
- because it has ~~fastest~~ best case time complexity $= O(n \log n)$

$O(\log n)$ is tighter than $O(n)$ & is also better

in algo analysis.

	Selection	Bubble	Quick	In
Best	$O(n^2)$	$O(n)$	$O(n \log n)$	O(
Worst	$O(n^2)$	$O(n^2)$	$O(n^2)$	O(

Ques 5

Expression	Stack
234*6/+	2
34*6/+	23
4*6/+	234
*6/+	234*
6/+	2 12
/+	2 12 6
+	2 12 6 /
+	2 2

Ans 4