

الإسم الرقم

أجب عن جميع الأسئلة

ورقة الامتحان تشتمل على عدد 11 صفحات

<u>Question No</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>Total</u>
<u>Mark</u>							\ 100

Note: Please check that your exam is complete. It should have **11** printed pages in total.

Questions One: (30 Marks)

A. Choose the Correct / Best answer. (10 Marks)

1. Benefits of studying Data Structure are

- A. Save Space
B. Save Time
C. Reduce the resources consumption
D. All of these

2. According to memory allocation, stack is an array but data from stack can only added and removed from

- A. Zeroth Index
B. Last Index
C. any where like array
D. Top of stack position

3. Is an ordered group of homogeneous elements with permits a deletion to be performed at one end and addition at the other end

- A. Tree
B. Linked List
C. Stack
D. Queue

4. The Basic properties of Linked List

- A. Abstract
- B. Sequence
- C. Group of Nodes
- D. All of these

5. which of these are stack applications

- A. Calculator
- B. Recursion
- C. Variable Scope
- D. All of these

6. The condition indicate that a Linked List is empty

- A. $Cur \rightarrow Next == NULL$
- B. $Head \rightarrow Next == NULL$
- C. $Cur == Null$
- D. $Head == NULL$

7. Which of the following data structure is linear data structure?

- A. Stack
- B. Queue
- C. Linked List
- D. all of these

8. A binary tree whose every node has either zero or two children is called

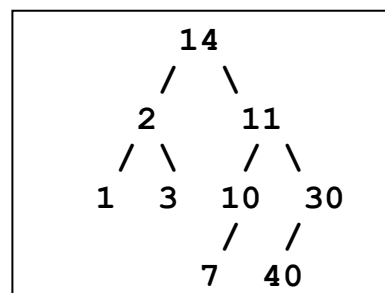
- A. Binary search tree
- B. Full Binary tree
- C. Complete binary tree
- D. None of the above

9. In general, linked Lists allow:

- A. Insertions and removals only at one end
- B. Insertions and removals anywhere
- C. Insertions at the back and removals from the front
- D. None of the above

10. There is a tree in the box. How many leaves does it have?

- A. 2
- B. 4
- C. 6
- D. 9



B. Match each of the algorithm description described at Column A with the most appropriate algorithm or data structure at Column C by writing the Number corresponding to an algorithm or data structure in Column B. You should use each Number only once.

(10 Marks)

A	B	C
A. The sorting algorithm which repeatedly compares each pair of adjacent elements and swaps them if it is necessary.		1. Insertion Sort 2. Quick Sort 3. Queue 4. Stack 5. Tree 6. Selection Sort 7. Merge Sort 8. Binary Search 9. Linear Search 10. Bubble Sort
B. The sorting algorithm which shift array elements to the right to make space for the insertion.		
C. The searching algorithm which the element to be found is searched sequentially in the list.		
D. The searching algorithm which to search an element compare it with the element present at the centre of the list.		
E. The sorting algorithm which divide the lists into two equal halves, sort them and finally combine these sorted lists.		
F. The sorting algorithm which Picking the smallest elements and putting these elements at their proper position.		
G. The sorting algorithm which choosing a comparison element Pivot. All elements of the List that are less than Pivot are placed in the first part, all elements greater than Pivot are placed in the second part		
H. Provide access to elements in FIFO.		
I. The last element saved onto it is the first one retrieved.		
J. Represent hierarchical structure with parent child relationship between elements		

C. Identify True (T) or False (F) and rewrite the correct version of False one: (10 Marks)

1. When a new data are to be inserted into a data structure, but there is no available space; this situation is usually called overflow. ()

2. The term “Push” and “Pop” is related to the Queue. ()

3. Finding the location of the element with a given value is Sorting. ()

4. The programmer must know in advance how many memory nodes will be needed in a Linked List. ()

5. Binary Search Tree enables us to search large amounts of information in efficient manner. ()

6. The worst case occurs in linear search algorithm when item is the last element in the array or is not there at all. ()

7. Input data needs to be sorted in Binary Search and not in Linear Search. ()

8. Quick sort running time depends on the selection of Pivot element. ()

9. A Tree can grow and shrink in size dynamically at Run Time. ()

10. Level of a root node of a tree is 0. ()

Question Two : (20 Marks)

1. Trace the steps of Quick Sort to arrange the following array elements {55, 44, 33, 22, 11} in ascending order. (5 Marks)

2. An array contains the elements {55, 44, 33, 22, 11}. Using the Binary Search algorithm, Trace the steps followed to find (90). At each loop iteration, including the last show the position of first, last , middle. (5 Marks)

Iteration no	First	Middle	Last
(90) is at Position			found = False

3. Fill in the blank and then answer the questions (5 Marks)

```

1. Begin
2. Get Array Size ( N ).
3. Get Array elements ( List ).
4. ....
5. Let Position = 0
6. If ..... Then
7.     goto Step 12
8. Position = Position +1
9. If Position < N Then
10.     goto Step 6
    Else
11.     goto Step 14
12. Display Message ‘ Search key Found in Position
    Position.
13. goto Step 15
14. Display Message ‘ Search key Not Found ‘ .
15. End
    
```

b. What is the name of this algorithm?

c. How does the algorithm Work?

d. What is the worst case running time for this algorithm?

4. Fill in the blank (5 Marks)

```

void BubbleSort(int list[ ],int size) {
    int Pass , Comp , temp ;
    for ( Pass =1 ; ..... ; Pass ++ ) {
        for(Comp = 0 ; ..... ; Comp ++ )
        {
            if(list [Comp] > list [Comp+1] )
            {
                temp = list [Comp];
                list [j]= list [j+1];
                list [j +1]= temp; }
            } }
    }
    
```

B. Using example, Explain how does this function Work?

Example:

2. Use the Stack to evaluate the Postfix Expression below, show the state of stack at each step

4 3 2 * + 10 - . (5 Marks)

Expression	Action	Stack

Question Four : (15 Marks)

1. Suppose that you have the following Linear Queue

	0	1	2	3	4
	11	6	77	90	

Answer the questions **A** to **F** based on the previous Queue

A. What is the maximum size of a Queue? **(1 Mark)**

B. What is the initial value of Front and Rear? **(2 Marks)**

C. What is the last value that inserted into a Queue? **(1 Mark)**

D. What is the First value that inserted into a Queue? **(1 Mark)**

E. What is the Current value of Front and Rear? **(2 Marks)**

F. Draw the Queue after execution each statement and show the value of Front and Rear for each step **(8 Marks)**

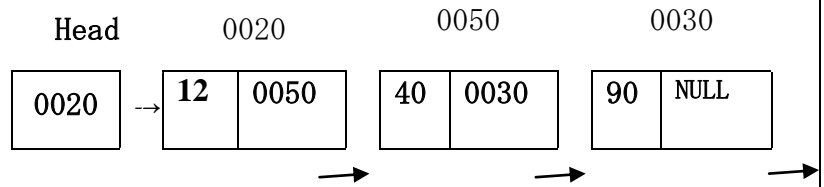
<p>1. insert (Q , 21)</p> <p style="text-align: center;">0 1 2 3 4</p> <table border="1" style="margin: auto; width: 100%; height: 40px;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> </tr> </table> <p>Front = _____</p> <p>Rear = _____</p>							<p>2. remove (Q)</p> <p style="text-align: center;">0 1 2 3 4</p> <table border="1" style="margin: auto; width: 100%; height: 40px;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> </tr> </table> <p>Front = _____</p> <p>Rear = _____</p>						
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Question Five : (10 Marks)

Study the following code carefully and answer the questions

```
void InesrtNode(int Item)
{
  Node *NewNode;
  NewNode=(Node* malloc(sizeof(Node));
  NewNode ->data= item;
  NewNode ->next =NULL;
  if(head==NULL)
    head = NewNode;
  else
  {
    NewNode ->next=head;
    head= NewNode;
  }
}
```

Assume the Linked list is



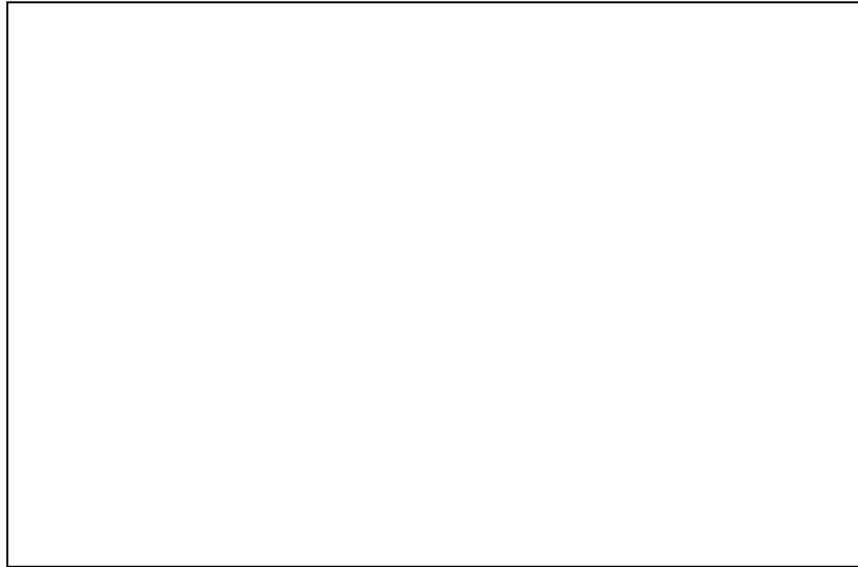
1. Draw the new Linked List after Calling the function InesrtNode (77) ? (5 Marks)

2. Write the function CountNodes () that Display each Node Data and count the number of Nodes in a Linked List? (5 Marks)

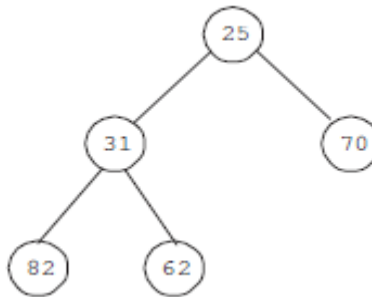
Question Six : (10 Marks)

If you have the set of keys { 90 ,15, 49, 35, , 101, 20 }

1. Build a Binary Search Tree to store these keys (3 Marks)



2. Given the following Tree



- A. There are three common methods for traversing a Binary Tree , traverse the tree using Inorder : _____ (2 Marks)
- B. Is the Tree is Full Binary Tree? _____ (1 Mark)
- C. Is the Tree is Complete Binary Tree? _____ (1 Mark)
- D. What is the height of the tree? _____ (1 Mark)
- E. What is the Degree of Node 31 , 82? _____ (1 Mark)
- F. What is the Level of Node 25 , 82? _____ (1 Mark)

The End of Exam

Good Luck "''''''''''