SAMPLE DSA PAPER-19.1 Group B

MCQ: 50 Marks (25 MCQs)
Structured Essay: 50 Marks

<Highlighted sections will not be covered in GROUP B examination>

Time: 03Hrs

Answer All Questions **Date:**

Part A: Multiple Choice Questions. Select the appropriate answer. Answer sheet is attached at the end of the MCQ question set. (50 mark)

1. Two main measures for the efficiency of an algorithm are

   a. Processor and memory
   b. Complexity and capacity
   c. Time and space
   d. Data and space
   e. None of the above

2. The searching technique that takes O (1) time to find a data is

   a. Insertion to unordered array
   b. Insertion to ordered array
   c. Deletion in unordered array
   d. Deletion in ordered array
   e. None of the above

3. You have to sort a list L consisting of a sorted list followed by a few "random" elements. Which of the following sorting methods would be especially suitable for such a task?

   a. Bubble Sort
   b. Quick Sort
   c. Insertion Sort
   d. Merge Sort
   e. Selection Sort

4. Let the following circular queue can accommodate maximum six elements with the following data

   front = 2 rear = 4
   queue = _____; L, M, N, ___, ___

   What will happen after ADD O operation takes place?

   a. front = 2 rear = 5
   b. front = 2 rear = 4
   c. front = 3 rear = 5
   d. front = 3 rear = 4
   e. front = 3 rear = 6

5. The quick sort algorithm exploit _____ design technique

   a. Divide & Conquer
   b. Dynamic Programming
   c. Greedy
   d. Backtracking
   e. Snow Ball

6. Which data structure is used for implementing recursion?

a. Stack
b. Queue
c. list
d. Linked List
e. Linear Queue

7. Linked lists are best suited

a. for relatively permanent collections of data
b. for the size of the structure and the data in the structure are constantly changing
c. for fixed size memory
d. For all the above situations
e. Cannot be apply to any of the above situations

8. Each node in a linked list has two pairs of ..... and .....

a. Link field and information field
b. Link field and Next field
c. Data field and information field
d. Address field and link field
e. None of the above

9. Which of the following name does not relate to stacks?

a. LIFO
b. FILO
c. FIFO
d. PUSH-DOWN
e. None of the above

10. In a queue, the initial values of front pointer f rare pointer r should be …….. and ……. respectively.

a. 0 and 1
b. 1 and 0
c. 0 and -1
d. -1 and 0
e. None of the above

01	a	b	c	d	e
02	a	b	c	d	e
03	a	b	c	d	e
04	a	b	c	d	e
05	a	b	c	d	e
06	a	b	c	d	e
07	a	b	c	d	e
08	a	b	c	d	e
09	a	b	c	d	e
10	a	b	c	d	e

Part B: Structured Essay Questions. **(50Mark)**

1.

a. Why Stacks are called “LIFO” structures and Queues are called “FIFO” structures. Explain the complexities in terms of Big O notations. If required, make a graphical representation.

   a. "LIFO" stands for **last-in, first-out**, meaning that the most recently item out first.A stack is a container of objects that are inserted and removed according to the last-in first-out (LIFO) principle

      .

   b. "FIFO" stands for first-in, first-out, meaning that the first inserted object out first. A Queue is a FIFO (First In First Out) data structure where the element that is added first will be deleted first.

(6 mark)

b. Briefly explain the concept of “Linked List” data structure.

   a. A linked list is a linear data structure where each element is a separate object. Each element of a list is divided into two items - the data and a reference to the next node. The last node has a reference to **null**.The entry point into a linked list is called the head of the list.

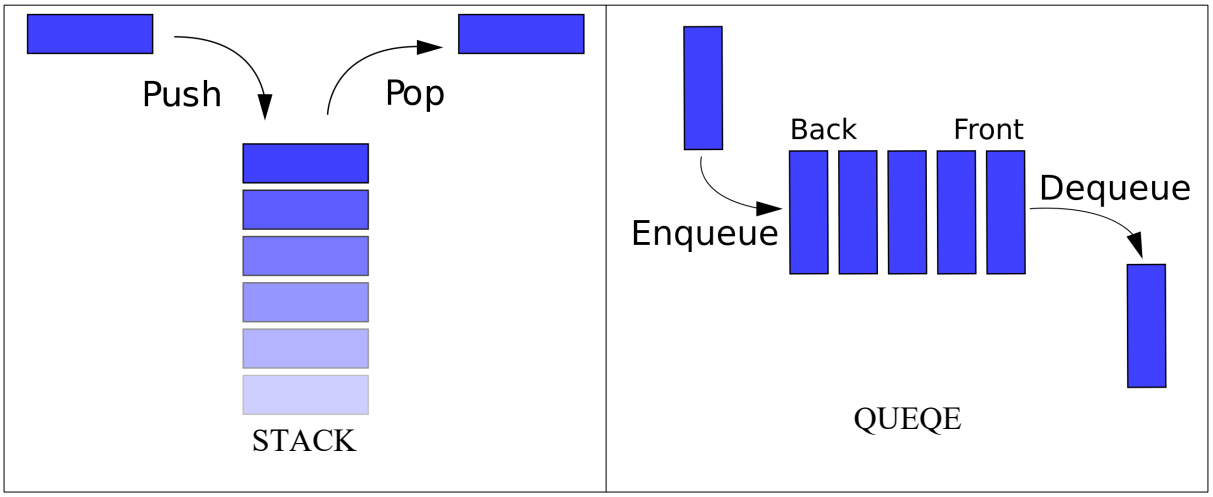
(4 mark)

c. Suppose an initially empty queue Q has performed a total of 32 enqueue operations, 10 front operations and 15 dequeue operations. What would be the current size of the queue? (No of elements in the current queue)

   i. 17

(2 mark)

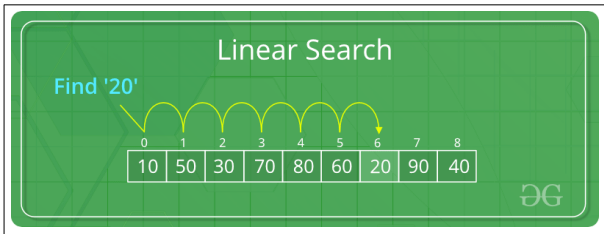
d. Derive the push/pop function and enqueue/dequeue operations



(8 mark)

2.

a. Using an appropriate array example, explain how main searching algorithms can be performed.



A Linear Search sequentially moves through your data structure looking for a matching value.

Binary search begins by comparing an element in the middle of the array with the target value. If the target value matches the element, its position in the array is returned. If the target value is less than the element, the search continues in the lower half of the array.

(8 mark)

b. Briefly explain where you may apply above searching algorithms and describe their complexities in terms of big O notation.

----------I think that Big O will not come----------

(6 mark)

c. Consider the following code block identify the problems with the code and resolve the problems. (6 mark)

```
int binarySearch(int array[], int size, int value)
{
  int first = 0, last*,middle, position*;
  boolean found = false;
  while (*found && first <= last)
  {
    middle = (first + last) / 2;
    if (array[middle] == value)
    {
      found = true;
```

```
            position = middle;
          }
          else if (array[middle] > value)
            last = middle +1;
          else
            first = middle -1;
        }
        return position;
      }
```

CORRECTIONS

1. last = size -1
2. position = -1
3. !found
4. array[middle] == value
5. last = middle – 1;
6. first = middle +1;
7. position = middle;

3.

a. Consider the following list of words:

apple, tree, car, dog, yellow, frog, gun, harp

I. Alphabetize the above list using an insertion sort. Show your work. (6 mark)

II. Alphabetize the above list using a bubble sort. Show your work. How many complete passes are necessary for the bubble sort to ensure the list is sorted? (6 mark)

III. Alphabetize the above list using a merge sort. Show your work. (6 mark)

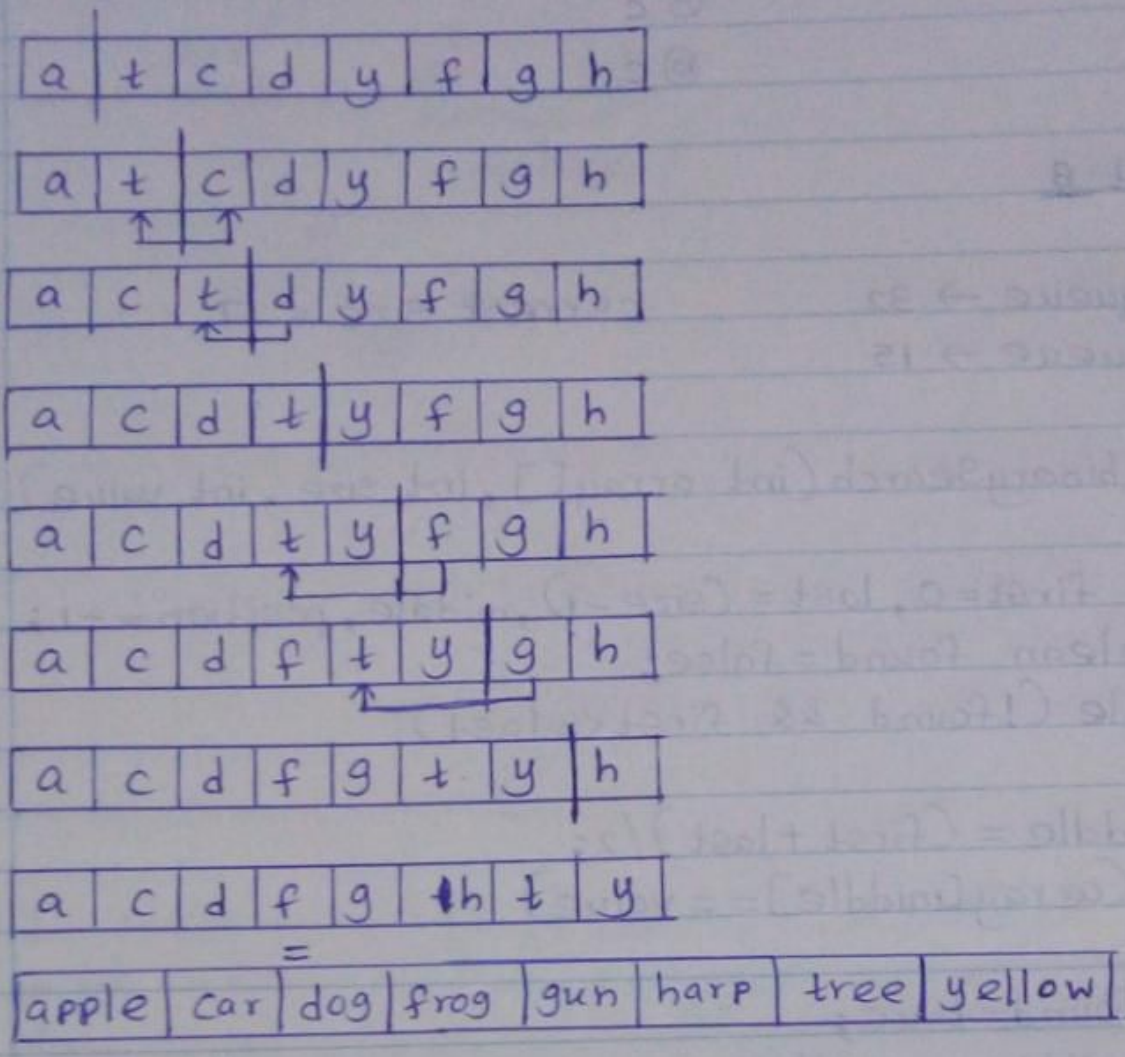
a. The insertion sort runs in linear time on an array already sorted. How does it perform it on an array that is sorted in reverse order? Hint: Consider only on performance no coding required.

a. Insertion sort takes maximum time to sort if elements are sorted in reverse order. And it takes minimum time (Order of n) when elements are already sorted. Also known as the worst case scenario

(2 mark)

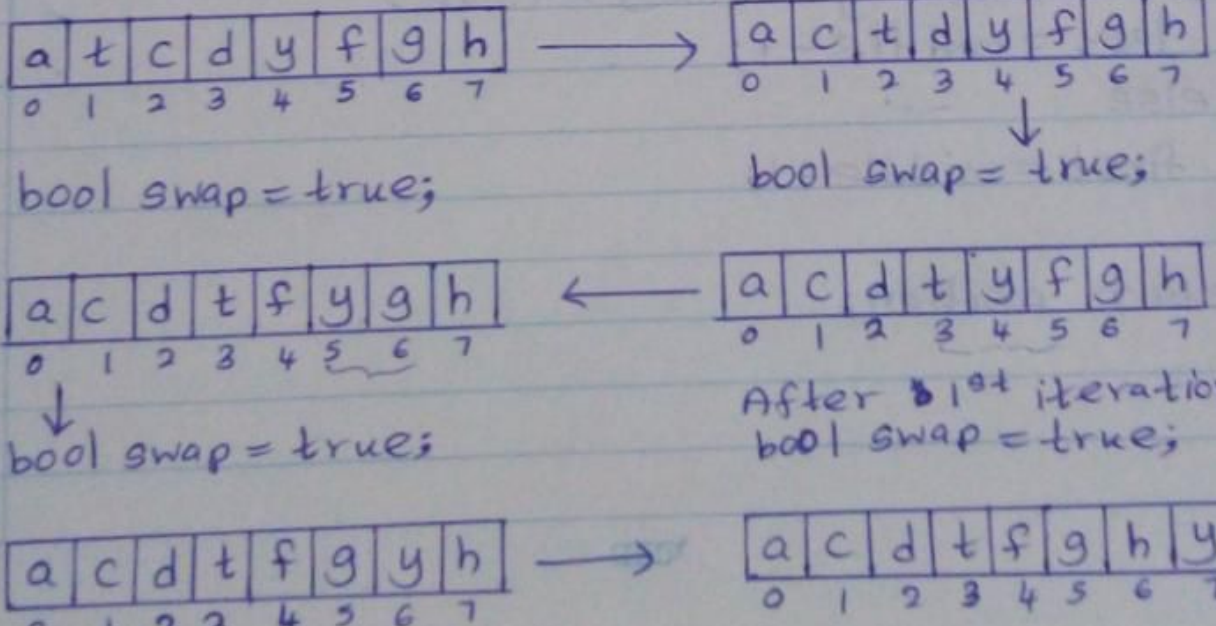
③ ② I) apple = a, tree = t, car = c, dog = d, yellow = y,
frog = f, gun = g, harp = h

* ~~Imagine~~ Assume like ~~that~~ above

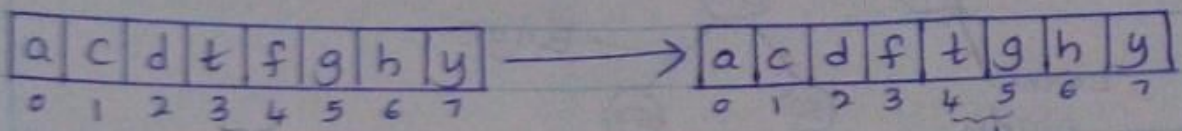


II) Start 1st iteration

bool swap = false;



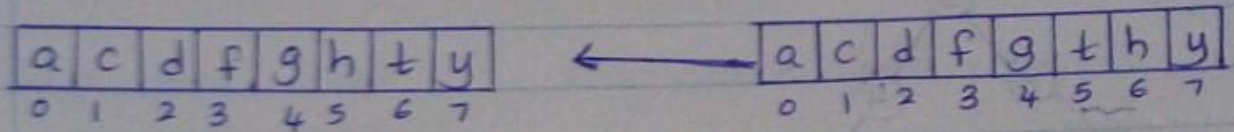
II) Start 2nd iteration
bool swap = false;



bool swap = true;

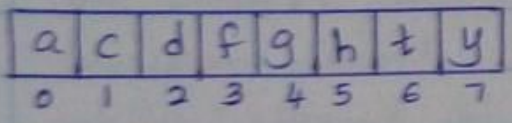
After 2nd iteration
bool swap = true;

bool swap = true;

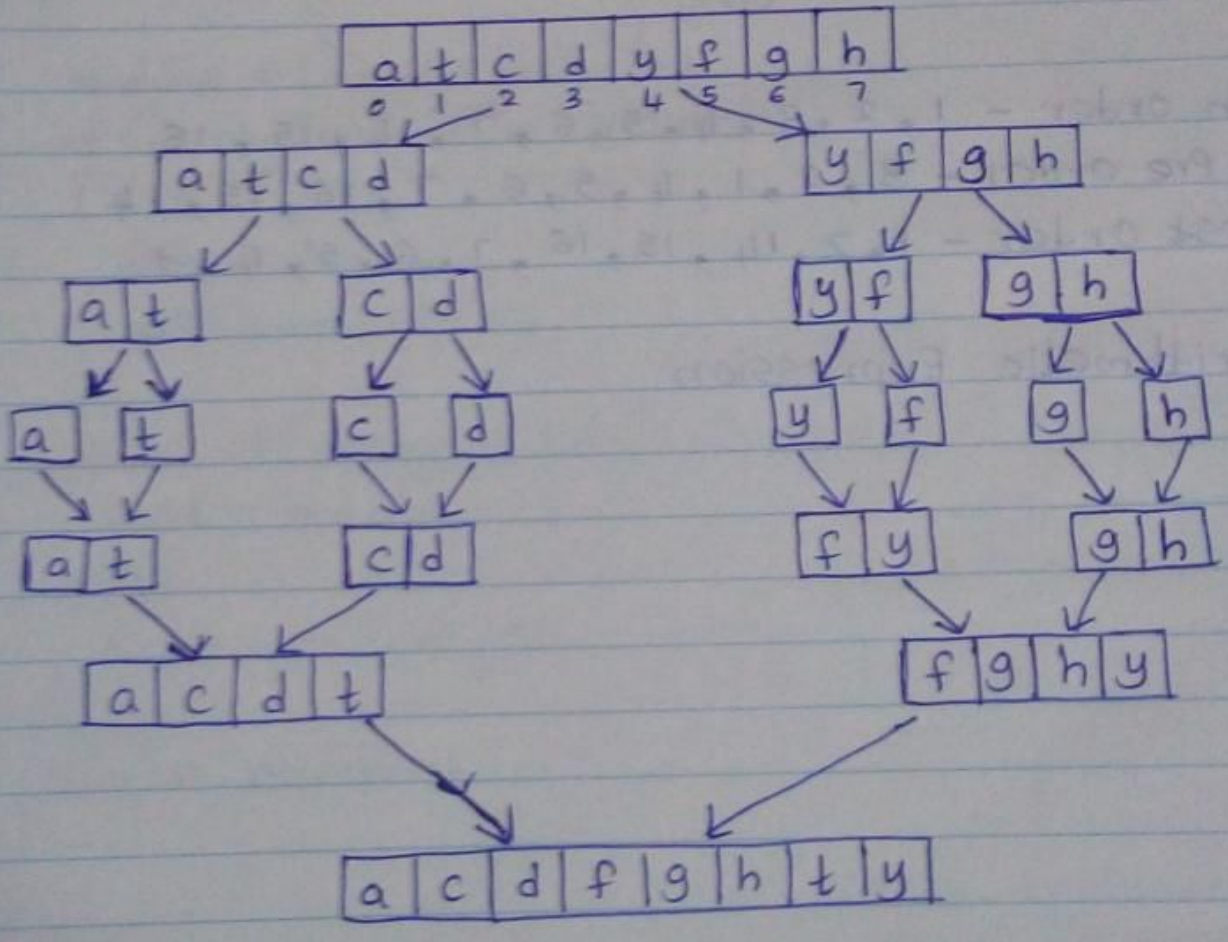


Start 3rd iteration
bool swap = false;

* Need three iterations



III)



4.

a. Draw a tree of your own and identify the followings. (4 mark)

   I. Root

   II. Siblings

   III. Edge

   IV. Leaf Node

b. Insert the values **3, 2, 1, 4, 5, 6, 7, 16, 15** and **14** in that order into a **binary search tree.** Clearly show the intermediate steps. (6 mark)

c. For the above developed graph derive the below traversing output. (6 mark)

   In order, Pre order and Post order output.

d. Describe a situation where you can apply binary tree concept.

   a. Arithmetic Expression

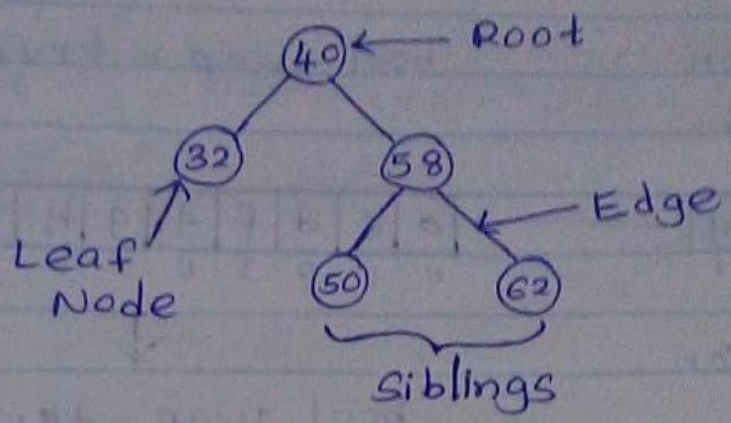
   b. Decision processes

   c. Searching

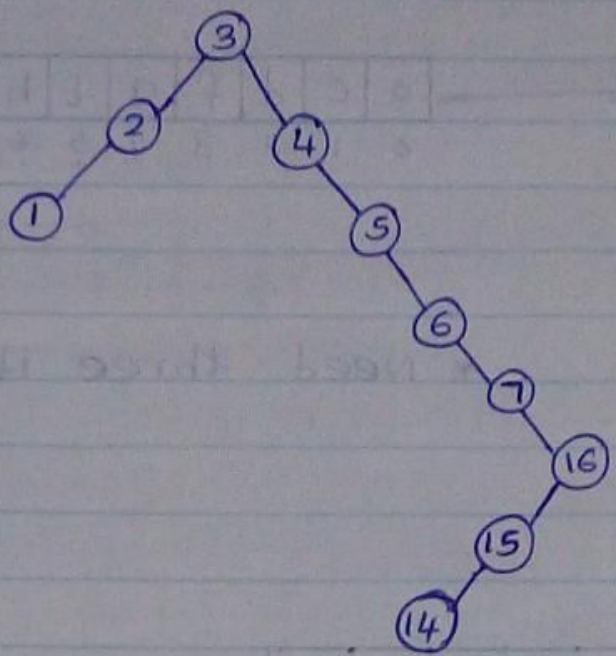
e. (4 mark)

---------- End of Paper----------

④ a)



b)



c) In order - 1, 2, 3, 4, 5, 6, 7, 14, 15, 16
Pre order - 3, 2, 1, 4, 5, 6, 7, 16, 15, 14
Post order - 1, 2, 14, 15, 16, 7, 6, 5, 4, 3

d) Arithmetic Expression