

## SAMPLE DSA PAPER

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

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

**Part B: Structured Essay Questions.**

**(50Mark)**

01.

- 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. (6 mark)
- b. Briefly explain the concept of “Linked List” data structure. (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) (2 mark)
- d. Derive the push/pop function and enqueue/dequeue operations (8 mark)

02.

- a. Using an appropriate array example, explain how main searching algorithms can be performed. (8 mark)
- b. Briefly explain where you may apply above searching algorithms and describe their complexities in terms of big O notation. (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;
}

```

03.

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.

(2 mark)

04.

- 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. (4 mark)

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