Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2018

CS3CO21 / IT3CO02

Data Structures

Programme: B.Tech. Branch/Specialisation: CSE/IT

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Predict the output of following C program. **1**

```
#include <stdio.h>
int main()
{
char a = '1';
printf("%d", a);
return 0;
}
```

(a) compile error (b) 1 (c) 49 (d) empty

ii. Which of these best describes an array? **1**

(a) A data structure that shows a hierarchical behaviour
(b) Container of objects of similar types
(c) Container of objects of mixed types
(d) All of the mentioned

iii. New nodes are added to the …… of the queue. **1**

(a) Front (b) Rear (c) Middle (d) Both (a) and (b)

iv. What happens when you push a new node onto a stack? **1**

(a) The new node is placed at the front of the linked list
(b) The new node is placed at the back of the linked list
(c) The new node is placed at the middle of the linked list
(d) No Changes happens

P.T.O.

v. Which data structure allows deleting data elements from front and inserting at rear. **1**
(a) Stacks (b) Queues
(c) Dequeues (d) Binary Search Tree

vi. Queue is also known as. **1**
(a) First in first out list (b) Last in first out list
(c) Both (a) and (b) (d) None of these

vii. Which of the following is a stable sorting algorithm? **1**
(a) Merge sort (b) Heap Sort
(c) Selection Sort (d) None of these

viii. Partition and exchange sort is. **1**
(a) Quick sort (b) Tree sort (c) Heap sort (d) Bubble sort

ix. Which of the following data structure is non-linear type? **1**
(a) Graph (b) Stacks (c) Lists (d) None of these

x. Which data structure is used in breath first search of a graph to hold nodes. **1**
(a) Array (b) Tree (c) Stack (d) Queue

Q.2 i. Why do you have to allocate memory at runtime? **2**
ii. Write a program to calculate factorial of a number, using recursion (In C / C++). **3**
iii. How a two-dimensional array is represented in memory? **5**
OR iv. Discuss the types of data structure in short. **5**

Q.3 i. What is doubly linked list? **2**
ii. What are the limitation of an array data structures? How can be avoided using linked lists? **8**
OR iii. Discuss the algorithm for insertion at a specified position in the linked list. **8**

Q.4 i. Explain the different operations to be performed on the data structures. **3**
ii. Discuss the tower of Hanoi problem. **7**
OR iii. Write an algorithm for evolution of postfix expression with example. **7**

Q.5 i. What is difference between sorting and searching operation. **4**
ii. Explain the merge sort and sort the following elements by using merge sort. **6**
< 70,20,30,40,10,50,60 >
OR iii. Sort the following data using radix sort 22,11,1,2,10,100. **6**

Q.6 Attempt any two:
i. What is an AVL Tree? Discuss various types of rotations required to balance an unbalanced AVL Tree. **5**
ii. Describe any algorithm to find out minimum spanning tree. **5**
iii. Suppose the following eight numbers are inserted in order into an empty binary search tree T, make binary search tree: **5**
50, 33, 44, 77, 35, 60, 40

******

Marking Scheme
CS3CO21 / IT3CO02 Data Structures

Q.1 i. Predict the output of following C program. **1**

```
#include <stdio.h>
int main()
{
char a = '1';
printf("%d", a);
return 0;
}
```

(c) 49

ii. Which of these best describes an array? **1**
(b) Container of objects of similar types

iii. New nodes are added to the …… of the queue. **1**
(b) Rear

iv. What happens when you push a new node onto a stack? **1**
(a) The new node is placed at the front of the linked list

v. Which data structure allows deleting data elements from front and inserting at rear. **1**
(b) Queues

vi. Queue is also known as. **1**
(a) First in first out list

vii. Which of the following is a stable sorting algorithm? **1**
(a) Merge sort

viii. Partition and exchange sort is. **1**
(a) Quick sort

ix. Which of the following data structure is non-linear type? **1**
(a) Graph

x. Which data structure is used in breath first search of a graph to hold nodes. **1**
(d) Queue

Q.2 i. Reason 1 mark **2**
Function allocate memory at runtime

ii. Program to calculate factorial of a number, using recursion (In C / C++). **3**
Logic 2 marks
Syntax 1 marks

iii. How a two-dimensional array is represented in memory? **5**
Representation of address 3 marks
Syntax 2 marks

OR iv. Types of data structure in short. **5**
Hierarchy of all types 2 marks
Short description 3 marks

Q.3 i. Doubly linked list **2**
Description 1 mark
Diagram/example 1 mark

ii. Limitation of an array data structures 2 marks **8**
Diagram of array 2 marks
How it overcome through linked list 4 marks

OR iii. Algorithm for insertion at a specified position in the linked list. **8**
Description 2 marks
Algorithm 4 marks
Diagram with node 2 marks

Q.4 i. Different operations to be performed on the data structures. **3**
List of all operations 1.5 marks
Description of operation 1.5 marks

ii. Tower of Hanoi problem. **7**
Diagram 5 marks
Example with description 2 marks

OR iii. Algorithm for evolution of postfix expression with example. **7**
Algorithms 5 marks
Example/description 2 marks

Q.5 i. Difference between sorting and searching operation. **4**
Sorting operation 2 marks
Searching operation 2 marks

ii. Explain the merge sort and sort the following elements by using merge sort.< 70,20,30,40,10,50,60 > **6**
Explanation of merge sort 2 marks
Sort of numbers 4 marks

OR	iii.	Sort the following data using radix sort 22,11,1,2,10,100. Sorting with numbers		**6**
Q.6		Attempt any two:		
	i.	AVL Tree Types of rotations in AVL	1 mark 4 marks	**5**
	ii.	Any algorithm to find out minimum spanning tree. About minimum spanning tree Algorithms for minimum spanning tree	 2 marks 3 marks	**5**
	iii.	Suppose the following eight numbers are inserted in order into an empty binary search tree T, make binary search tree: 50, 33, 44, 77, 35, 60, 40 Tree diagram with steps		**5**

******