

## III SEMESTER B.TECH. (INFORMATION TECHNOLOGY | COMPUTER AND COMMUNICATION ENGINEERING)

## **MAKE UP EXAMINATIONS, DECEMBER 2019**

## SUBJECT: DATA STRUCTURES [ICT 2153]

## REVISED CREDIT SYSTEM (/12/2019)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data, if any, may be suitably assumed.

**Q1.** Write a user defined function to sort elements using quick sort. Trace the function to sort the following set of elements: 15, 12, 3, 45, 23, 7, 9, 11, 45, 78, 99, 34, 23, 49, 55 (5)

 $\frac{Q2}{Q2}$  Write user defined functions to insert and delete a number to or from a circular queue  $\frac{(3)}{(3)}$ 

Q3. Define space complexity. Determine the step count table for the given algorithm. (2)

```
algorithm Fibonacci(n) {

if n \le 1 then

output 'n'

else

f2 = 0;

f1 = 1;

for i = 2 to n do

{

f = f1 + f2;

f2 = f1;

f1 = f;

}

output 'f'

}
```

Q4. Explain the following with examples:

- i. Memory representations of a binary tree
- ii. Depth of a binary tree

(5)



- iii. Degree of a tree
- iv. Full binary tree
- v. Strictly binary tree

Q5. Define a class bank account, which includes name of the depositor, Account Number, Type of the account and Balance amount in the account. You need functions to set the initial values, to deposit an amount, withdraw amount after checking balance and finally display name, account number with updated balance. Write a menu driven C++ program. (3)

Q6. Construct a binary tree given its inorder and preorder sequence as B F G H P R S T W Y Z and P F B H G S R Y T W Z. Also write the postorder traversal sequence for the constructed binary tree. (2)

Q7. Write a complete C++ program to implement basic operations (insert, delete, display) on Priority Queue using circular singly linked list. Each node of the list contains an integer element and it's associated priority. Priority varies from 1 (highest priority) to 5 (lowest priority). Multiple elements may have same priority. Display should be according to

priority of the elements. (5)

**Q8.** Given two singly linked lists, write a user defined function to insert nodes of the second list into first list at alternate position of the first list. (Consider both the lists contain 5 nodes each). For example : if the first list is 1->4->8->10->12 and the second list is 2->5->9->11->15, then the resulting list should be 1->2->4->5->8->9->10->11->12->15 (3)

Q9 Write a complete C++ program to convert a decimal number into any base using stacks. Use class concept. (2)

Q10. Write a complete C++ program to implement multiple queues using a single array. Use class concept (5)

Q11. Write a complete C++ program which implements stack of strings using class concept. (Do not use built in string.) (3)

Q12. Write a non recursive function to create a Binary Search tree. (2)



**Q13.** A sparse matrix is represented using a standard "Compressed Sparse Row (CSR)" format. Representation uses three arrays: Value, Col index and Index ptr. Value array stores the non-zero elements. Col index stores column indices of the non-zero elements. Index ptr : stores index to the beginning of each row entry in col index and value array. For example consider a matrix ARR,

 $ARR = [\{1, 0, 2\}, \{0, 0, 3\}, \{4, 5, 6\}]$ 

In ARR value at ARR[1][2] is 3. Value array stores 3, Col index stores 2. Index ptr[1] stores 2. It means that in Value array the entry for non-zero elements of row 1 starts at index 2. For the given array ARR, Value: [1, 2, 3, 4, 5, 6], Col index: [0, 2, 2, 0, 1, 2], Index ptr: [0, 2, 3, 6]. Last entry in Index ptr array represents the number of non-zero elements.

Write a suitable class definition with required data members and a member function to represent the sparse matrix ARR of dimension mxn in CSR format. (5)

Q14. Write the algorithm for evaluation of expression in postfix form. Also give the functions required for evaluation, in c++ for the same. (3)

Q15. What is a spanning tree? Draw any two spanning trees for the graph given in Figure Q15. (2)



Figure Q.15