

# INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL B.Sc. (Applied Sciences) in Engg. End – Semester Theory Examinations – Nov./ Dec. 2020 III SEMESTER - DATA STRUCTURES (ICS 231) (Branch: CS)

<ul> <li>✓ Answer ANY FIVE full questions.</li> <li>✓ Missing data, if any, may be suitably assumed</li> </ul>	

- 1A. Differentiate between iterative and recursive approach of programming (Any three points). Write a recursive C++ function for binary search and calculate the time complexity.
- 1B. Calculate c and n0 for the expression :  $n^3+5n^2+10$ , in order to represent the expression in Big Oh notation. What is the Big Oh notation for this expression.

## (15M+5M)

2A. Write an algorithm to evaluate a postfix expression and trace that algorithm to evaluate the following postfix expression:

## 723^+3-4/5\*

Note: above expression contains digits 1 to 9 as operands and ^ exponent, \* multiplication, / division, + addition, - subtraction

2B. Write a complete C++ program to demonstrate the functionality of multiple stack.

#### (10M+10M)

3. In a hospital, Covid-19 patients list is managed and provided them with the facility at the hospital. To provide the facility a doubly linked priority queue is managed, taking waiting time as the priority. Insert patients in the queue as per the ascending waiting time. Once they are allotted the facilities, they are removed from the queue. Patient's information: name and age is recorded.

This application performs: insertion in the queue, display patients details, removal of patient from the queue once he/she assigned the facility.

Write a complete C++ program to simulate the above situation using priority queue. Demonstrate enum data type.

Patient's Type	Waiting time
Emergency	0
Symptotic	1 Day
Asymptotic	1 Week

(20M)

- 4A. Write a complete C++ program to insert the record of a student(name, rollno, age) in a doubly linked list at a node specified by position. ( only insert and create function with main ( ))
- 4B. Define push() and pop() function for single linked stack. Assume that all necessary functions and classes have been defined.

#### (12M+8M)

- 5A. Describe advantages of function template. Which situation it is necessary to override the function template by an actual function? Explain with the help of an example code.
- 5B. What are the advantages of circular queue over ordinary queue? Write Complete C++ code to demonstrate functionality of circular queue.

#### (8M+12M)

6. Given a list of numbers 22, 7, 6, 1, 60, 11, 77, 59, 19, 20, 17. Show each phase of creating a Binary search tree using them, starting from 22. Describe all three cases of deletion from the binary search tree taking resultant binary search tree into consideration.

# (20M)

- 7A. Considering above binary search tree, manually shown with arrow path, traverse the tree and write the path of traversal for the following techniques:
  - i) Inorder
  - ii) Preorder
  - iii) Postorder
- 7B. Write recursive function to find height of a tree. Also explain the working with the help of an example.

## (12M+8M)

- 8A. Find the time complexity of Quick Sort and Trace the function for the values: 45, 26, 27, 70, 14, 90
- 8B. Write complete program for Merge sort function.

#### (12M+8M)

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