Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING)
ONLINE GRADE IMPROVEMENT / MAKE-UP EXAMINATIONS, JULY 2021

SUBJECT: DATA STRUCTURES [ICT 2153]
REVISED CREDIT SYSTEM
(26/07/2021)

Time: 2 Hours **MAX. MARKS: 40**

Instructions to Candidates:

- Answer **ANY FOUR FULL** questions.
- Missing data if any, may be suitably assumed.
- Do not use structures, templates while writing C++ code, use classes only.

1A. Write a complete C++ program with class concept, which performs the following:
i. Read two sparse matrices A and B and represent them in the array of objects format.
ii. Create a function which takes A and B represented in array of objects format, as arguments and displays C i.e., the result of multiplication of A and B in the array of objects format. **6**

1B. Write down individual and total step count in detail as table, for the code in Figure Q1B.

```
void f( ) {
  int i,j,a,b,x,y;
  for(i=0;i<a;i++)
  {   x++;
   for(j=0;j<b;j++)
        cout<<i<<j;
   y++;
  }
 }
```

Figure Q1B **4**

2A. Write a complete C++ program with class concept, to implement multiple circular queues using a 1D array. Check all possible conditions and print suitable messages to the user wherever necessary. **6**

2B. Write a user defined function which reads an expression from the user. After reading the expression, it should then check if the expression has balanced brackets or not.
Note: The balance check must be done using stacks. The brackets can be any combination of '(', ')', '{', '}', '[', ']'.
Check all the conditions and print suitable messages to the user wherever necessary. **4**

3A. Write a user defined function to implement multiple stacks using singly linked lists. Create a singly linked list of headers, H, with n nodes and singly linked lists, S1....Sn, to store the values. Each node in H acts as a header node for each list S1...Sn. **6**

3B. Evaluate the following expression: P A Q - / B R C + * + where P = 12, A = 7, Q = 3, B = 2, R = 1, C =5. Show each step of evaluation using stacks. **4**

4A. Given two singly linked lists, write a user defined function to

i. insert nodes of the second list into first list wherever the number is missing. (Consider both the lists contain 5 nodes each). For example: if the first list is 1→3→4→6→10 and the second list is 2→5→7→8→9, then the resulting list should be 1→2→3→4→5→6→7→8→9→10.

ii. Divide the newly constructed list into two separate linked lists where one containing all odd numbers and another containing all even numbers in increasing order. **6**

4B. Write a user defined function to read a string and store each character of the string as the node value. For example: if the input string is ”PALINDROME”, then the SLL will look like P→A→L→I→N→D→R→O→M→E→NULL. Count the number of each vowel in it and display each count. **4**

5A. Write an algorithm to delete any type of node from a binary search tree. Trace this algorithm and show each step involved in deletion of 150 from the binary search tree given in Figure Q5A.

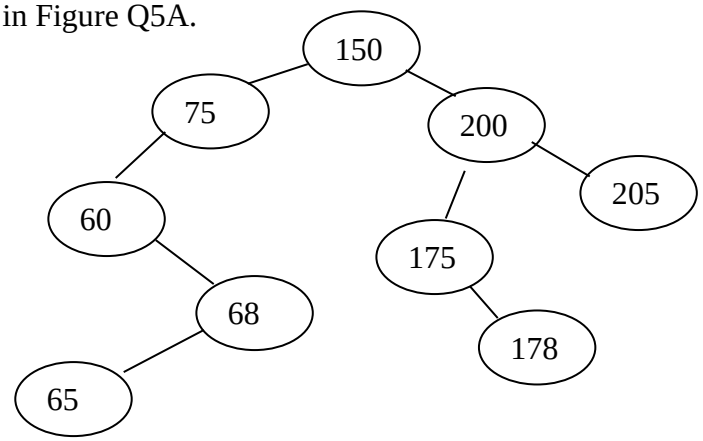

Figure Q5A **6**

5B. Write the level order, preorder, postorder and inorder traversal for the following tree in Figure Q5B.

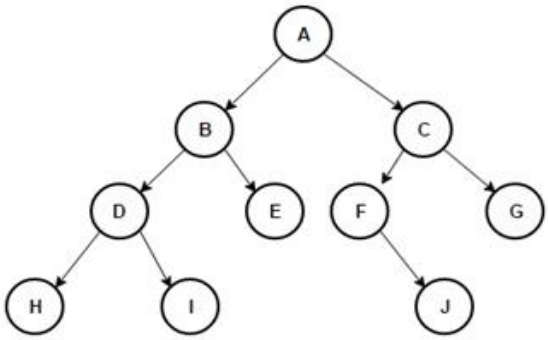

Figure Q5B **4**

6A Write the algorithm for quick sort and trace the algorithm for the array {45, 12, 34, 49, 89, 67, 32, 11, 9}. **6**

6B Write the adjacency list and adjacency matrix representation for the graph given in Figure Q6B. **4**

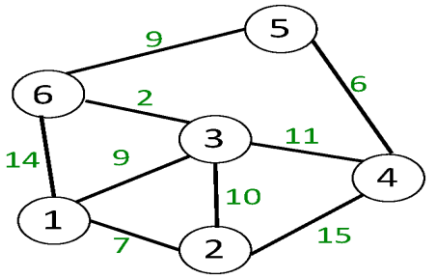

Figure Q6B

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