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## MANIPAL INSTITUTE OF TECHNOLOGY Manipal University SIXTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - APRIL / MAY 2017 SUBJECT: DATA STRUCTURE AND ALGORITHMS (ECE - 4024)

TIME: 3 HOURS
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MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Create a class called **COMPLEX** which contains private data members to store real and imaginary values of type float and public member functions for input and output operations. Create an overloaded friend function of the form ADD(a, S2), ADD(S1, S2), where S1, S2 are complex objects and 'a' is a real part. Write an interactive C++ program to add two complex number and display the result.
- 1B. Write an algorithm and C++ program to insert an element at  $j^{th}$  position in the array data structure.
- 1C. Two main measures for the efficiency of an algorithm are ...... and .....

(5+4+1)

- 2A. Convert manually the following infix expression to postfix. Show the content of stack at each steps.
  i). A + B \* C D / E \* F
  ii). (A + B \* C D ) / (E \* F)
- 2B. What is the disadvantage of linear queue? How do you overcome this drawback? Write a formula based C++ program to implement such a solution.
- 2C. ..... is very useful in situation when data have to stored and then retrieved in reverse order.

(5+4+1)

- 3A. Create a class called **DLIST**(Doubly Linked List) with private data members and member functions to insert a node at a specified position, delete a node from a specified position of the list and display the list. Class contains a private data member NODE of type struct which has a data and link fields. Functions to insert and delete a node should take only position as an argument. Write an interactive C++ program to demonstrate the operations by displaying the content of the list after every operation.
- 3B. Create a class called **SLIST** which contain private data members **NODE** of type struct to hold data and link field and necessary member functions to append, display and reverse the list. Write an interactive C++ program to reverse a singly linked list without using another list.
- 3C. Linked list is generally considered as an example of ..... type of memory allocation.

(5+4+1)

- 4A. Define Binary Search Tree (BST). Create a binary search tree in the order of given input as: 17, 13, 6, 7, 90, 33, 99, 44, 58, 20, 43, 100, 5. Display the BST created at this point using postorder and preorder traversal.
- 4B. Construct a Huffman tree for the input symbols and their frequencies are given in the table:

Symbols	А	В	C	D	E	F
Frequency	5	7	20	5	20	45

Encode the following message using the Huffman tree: ADCFEEA

4C. Suppose a binary tree is constructed with n nodes, such that each node has exactly either zero or two children. The maximum height of the tree will be .....

(5+4+1)

- 5A. Explain the Binary search algorithm with example. Write a C++ program to implement the same.
- 5B. Write a function for Quick Sort. Trace the function for the following input values: 45, 26, 27, 70, 14, 90.
- 5C. If the number of records to be sorted is small, then ..... sorting can be efficient.

(5+4+1)