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

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL 2018
SUBJECT: DATA STRUCTURE AND ALGORITHMS (ECE - 4020)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Create a structure called 'Date' with data members date (integer), month (string) and the year (integer). Create another structure called 'Employee' with data members for employee name (string), salary (float), employee id (integer) and the date of join which is of structure type 'Date'. Write a code in 'C++' to create an array of N instance of such Employee records and initialize and display all its member fields.

1B. Define the following w.r.t binary tree: Parent, Degree of Tree, Level of tree and Edge.

1C. …………….. is a special member function used to initialize the data members of the class.

(5+4+1)

2A. Define a class called **SLIST** which represents single linked list. Provide a nested class called NODE which represents a name, Item number, price and a pointer to the next node in the list. Define constructor and destructor in the class. Write an interactive main program and necessary member functions of the class to perform following operations:
   a.   Delete node before N^{th} node   b.   Add node at Front

2B. We have two arrays A and B, each of N integers. Write a function **check (int *, int * , int)** in C++ which receives the address of the both arrays and number of elements and tests if every element of array A is equal to its corresponding element in array B. In other words, the function must check if A[0] is equal to B[0], A[1] is equal to B[1], and so forth using pointer concepts. The function is to return 1 if all elements are equal and 0 if at least one element is not equal. Use main to test the function written by you.

2C. If the elements "A", "B", "C" and "D" are placed in a stack in order and are deleted one at a time, what is the order of removal?

(5+4+1)

3A. Write an interactive C++ program to implement stack data structure using arrays.

3B. Convert manually the following infix expression to postfix and prefix. Show the intermediate steps. (Note: A$B   is nothing but A^{B})
   i. A+(B * C-(D/E$F)*G)*H   ii. A$B$C+(D+(E-F/G)+H*I)$J

3C. A normal queue, if implemented using an array of size MAX_SIZE, gets full when ……………

(5+4+1)

4A. Construct a Binary Search Tree (BST)for the input keys 200, 100, 300, 90,150,400,250,120, 180 in the order for the initial empty tree. How do you construct a threaded binary tree? Using the same convert the BST drawn by you into the threaded binary tree.

4B. A source generates a message symbols with certain frequencies are given in the table:

Symbols	a	f	l	o	r	t
Frequency	7	8	5	3	9	4

Construct Huffman tree and encode the message "flat" using the above constructed Huffman tree.

4C. The number of edges from the root to the node is called ………………. of the tree.

(5+4+1)

5A. Write a function for Quick Sort. Trace the function for the following input values: 45, 26, 27, 70, 14, 90.

5B. What are the methods used to represent undirected graph? Represent the graph given Fig 5B using both the representation methods.
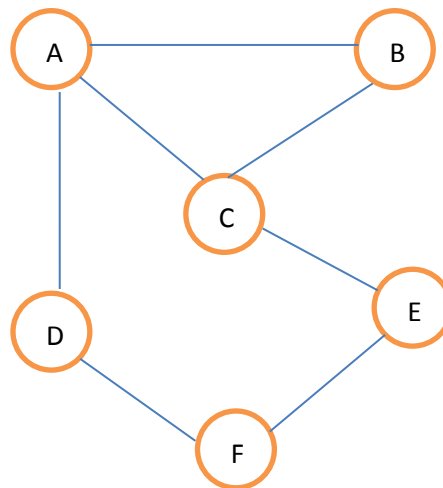

Fig 5B

5C. In a max-heap, element with the greatest key is always in the which node?

(5+4+1)