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INTERNATIONAL CENTRE FOR APPLIED SCIENCES
(Manipal University)
II SEMESTER B.S. DEGREE EXAMINATION – NOV. 2017

SUBJECT: DATA STRUCTURES (CS123)
(BRANCH: CS & CE)
Saturday, 25 November 2017

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A. 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) ABC+(D+(E-F/G)+H*I)$J

1B. What is a function template? In which scenario it is necessary to override the function template by an actual function? Explain with an example.

(8 + 12)

2A. What is space and time complexity? Explain. Calculate the time complexity for the following function using step count table and represent using Big-oh notation.

```
void funct(int m, int n)
{       int i,j;
        for (i=0;i<m;i++)
           for (j=0;j<n;j++)
                cout<< i*j;
}
```

2B. Give the algorithm for converting an Infix expression to postfix using stack. Show the working of the algorithm by considering the expression A * (B + C) * D, showing the stack contents and output after each token.

(10 + 10)

3A. Write the following functions for the class list (singly linked list) .

i) int list:: isPresent (int data) { } to search for a node with data as info field.

ii) void list ::ins_at_front(int new_data) { }

3B. Write a member function to find Union of two unsorted linked lists with the signature, list list :: getUnion (list l2) { ...} using the functions defined in question 3A.

(12 + 8)

4A. Write a function to convert decimal to binary using stack. Also write main() to show the function call.

4B. Why is the circular queue better than linear queue? Explain with an example. Write the required functions to implement circular queue operations using integer array of size N.

(8 + 12)

5A. Write a non-iterative function to delete a node from a binary search tree. Explain the function you have written using example(s).

5B. What is an expression tree? Write a function to create a binary tree for the given postfix expression. **(12 + 8)**

6A. A Define the following terms with examples.

i) Binary tree
ii) Strict binary tree
iii) Complete binary tree
iv) Almost complete binary tree

6B. What are the applications of queue data structure?

(12 + 8)

7A. Construct a Binary search tree for the list of alphabets given below by taking the first element as root: J, R, D, G, T, E, M, H, P, A, F, Q
Also write down the output of inorder and preorder traversal for the above tree.
7B. Give the function for Quick Sort algorithm. Also mention the time complexity of Quick Sort. Trace the function for the following input values:
45, 26, 27, 70, 14, 90

(8+ 12)

8. Write short notes on the following:

A. Adjacency Matrix
B. Depth First Search
C. Hashing.
D, Non Linear data structure

(4x5)