AUTUMN END SEMESTER EXAMINATION-2016

3rd Semester B.Tech & B.Tech Dual Degree

DATA STRUCTURE AND ALGORITHM

CS-2001

(Regular-2015 & Back-2014, 2013 Admitted Batch)

Time: 3 Hours **Full Marks: 60**

Answer any Six questions including question No.1 which is compulsory.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. a) What is the time complexity of the function func()? [2 × 10

```
int func(int n)  {
  int count = 0;
  for (int i = 1; i <= n; i++)  {
    for (int j = 1; j < n; j += i)  {
      count++;
    }
  }
}
```

b) Given a single linked list L, write an algorithm/ function to insert an element X after a position P (address of the node) in the list.

c) Write a function to check whether a linked list is circular linked list or not.

d) Convert the expression ((A+B)*C-(D-E)^(F +G)) to equivalent prefix and postfix notations.

e) The five items: A, B, C, D and E are pushed into a stack, one after the other starting from A. The stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back onto the stack. Now one item is popped from the stack. What is the item which has been last popped?

f) The inorder and preorder traversal of a binary tree are H B J K I A F G D E C and A B H I J K C D F G E respectively. Find the postorder traversal of the binary tree.

g) Write an algorithm to find the number of nodes in a binary tree.

h) Write a pseudo code to minimize the unnecessary comparisons made in bubble sort algorithm.

i) Consider the array A[]= {65, 45, 85, 15, 35}, apply the insertion sort to sort the array. What is the total number of comparisons required when element 15 reaches the first position of the array?

j) Consider a hash table with 9 slots. The hash function is h(k) = k mod 9. The collisions are resolved by quadratic probing. The 9 keys are inserted in the order: 50, 37, 64, 24, 29, 42, 57, 45, 73. Draw the hash table.

2. a) Write a C function to find the elements having minimum difference in a given array. [4

b) Describe 3-tuple representation of sparse matrix. Write an algorithm to add two sparse matrices. [4

3. a) Write an algorithm/ function to delete the second occurrence of an element X from a double linked list. [4

b) Write suitable routines/ functions to perform insertion and deletion operations in a double ended queue(DEQUE) using array. [4

4. a) Write an algorithm to determine whether two binary trees are identical or not. [4

b) Explain depth first search graph algorithm with necessary data structure. [4

5. a) What is height balanced tree? Construct a balanced tree inserting the elements in sequence: 3, 2, 1, 4, 5, 6, 7, 16, 15, 14, 10, 12, 14, 11. Write the balance factor of every node of the AVL tree that is drawn, to the right of each node. [4

b) Discuss the importance of B-tree and explain the procedure for inserting elements in a B-tree with suitable example. [4

6. a) Describe the concept of binary search technique. Write a non-recursive algorithm/ function to find the desired item in an array using binary search. Justify, it is efficient as compared to linear search. [4

b) Explain how does merge sort algorithm work. Show the step-by-step process to arrange the list of elements: 80, 75, 45, 90, 30, 40, 15, 95, 5, 50, 10 in ascending order using merge sort. Also discuss its drawback. [4

7. a) Illustrate the steps to sort the sequence: 8, 1, 4, 1, 5, 9, 2, 6, 5 by using quicksort, with the middle element as pivot. [4

b) What is collision in hashing? Explain any two methods to overcome collision problem with suitable example. [4

8. Write short notes (ALL) [4 × 2

a) Priority queue

b) Divide-and-conquer principle

c) Expression Tree

d) Threaded Binary Tree

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