AUTUMN END SEMESTER EXAMINATION-2013

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

DATA STRUCTURE & ALGORITHM CS-301

(Regular-2012 & Back of previous batches)

Full Marks: 60 Time: 3 Hours

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) Write the worst case time complexity of the following- [2 × 10

   - Insertion in BST
   - Binary search
   - Inserting an element into a queue
   - Quick sort

   b) Here is an array which has just been partitioned by the first step of quicksort:

   3, 0, 2, 4, 5, 8, 7, 6, 9

   Which of these elements could be the pivot? (There may be more than one possibility!)

   c) Construct the binary tree given the following traversals.

   Pre-order : A B D G H C E I F

   In-order : G D H B A E I C F

d) What is the difference between binary tree and binary search tree? Make a BST for the following sequence of numbers.

45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48

e) Write a C program for representing a polynomial using linked list.

f) What is the purpose of a stack in implementing a recursive procedure? Explain.

g) Define ADT. Is it necessary to know how an ADT is implemented in order to use it? Justify your answer.

h) Discuss the advantages and disadvantages of the link list and array-based implementations of a queue.

i) What are the two broad classes of collision resolution techniques? Explain.

j) Write the prefix & postfix form of the following.

- ((A + B) * C – (D – E)) $ (F+G)
- (A + B) * (C + D – E) * F

2. a) How do you find the complexity of an algorithm? What is the relation between the time and space complexities of an algorithm? Justify your answer with an example. [4

b) Two linked lists contain information of the same type in ascending order. Write a C function code to merge them to a single linked list that is sorted. [4

3. a) Explain how to implement two stacks in one array A[1…n] in such a way that neither stack overflows unless the total number of elements in both stacks together is n. [4

b) What is AVL tree? Explain how the height is balanced after addition of nodes in it? Explain with suitable example with minimum six nodes. [4

4. a) The following values are to be stored in a hash table [4

25, 42, 96, 101, 102, 162, 197

Describe how the values are hashed by using division method of hashing with a table size of 7. Use chaining as the method of collision resolution.

b) What are stacks? How can stacks be used to check whether an expression is correctly parenthized or not. For e.g.(()) is well formed but (( ) or)( )(is not. [4

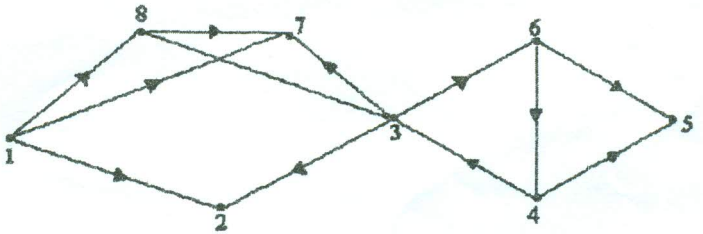
5. a) Write an algorithm for selection sort. Describe the behaviors of selection sort when the input is already sorted. [4

b) What is B-Tree? Construct a B-Tree of order 3 for the following set of Input data: [4

69, 19, 43, 16, 25, 40, 132, 100, 145, 7, 15, 18

6. a) Write a non-recursive algorithm to traverse a binary tree in Postorder. [4

b) Show the result of running DFS on the directed graph given below using vertex 3 as source. Show the status of the data structure used at each stage. [4



7. a) Sort the following list using Heap Sort [4

66, 33, 40, 20, 50, 88, 60, 11, 77, 30, 45, 65.

b) Let a binary search tree 'T' be in memory. Write a procedure to delete all terminal nodes of the tree. [4

8. a) Consider the algebraic expression [4

$E = (5*A+B)*(3*C+D) \wedge 3$

Draw the expression tree corresponding to E.

b) Consider an array A[20, 10]. Assume 4 words per memory cell and the base address of array A is 100. Find the address of A[11, 5] assuming row major storage. [2

c) Write down any four applications of queues. [2

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