



Name :
Roll No. :
Invigilator's Signature :

CS/B.TECH(EEE)(N)/SEM-5/EEE-504A/2012-13

2012

DATA STRUCTURE & ALGORITHM

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$
- i) The following sequence of operations is performed on a stack : push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), pop. the sequence of popped out values are
 - a) 2, 2, 1, 1, 2
 - b) 2, 2, 1, 2, 2
 - c) 2, 1, 2, 2, 1
 - d) 2, 1, 2, 2, 2.
 - ii) The elements of a two-dimensional array are stored linearly using which of the following methods ?
 - a) Row major storage
 - b) Column major storage
 - c) Both (a) and (b)
 - d) None of these.



- xi) Ratio of number of items in hash table, to the table size is called
- | | |
|--------------------|------------------|
| a) Load factor | b) Time factor |
| c) Balanced factor | d) all of these. |

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following 3 × 5 = 15

2. Write an algorithm to solve the Tower of Hanoi problem. Also draw the recursion tree for any set of initial values. 3 + 2
3. How can a polynomial such as $5x^4 - 3x^2 + 9x - 11$ be represented by a linked list ? Write the difference between stack and queue. 3 + 2
4. Are recursive routines more efficient than non-recursive routines ? Justify your answer with example.
5. What is data structure ? What are the data structures used to perform recursion ? List out the areas in which data structures are applied extensively.
6. Compare linked list with array in respect of both advantages and disadvantages.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Write an algorithm to convert a given prefix expression to postfix expression using stacks.
- b) Construct the following queue of characters where queue is a circular array which is allocated six memory cells. FRONT = 2, REAR = 4, QUEUE : , A, C, D, , . Describe the queue as the following operations take place :
 - i) F is added to the queue
 - ii) Two letters are deleted from the queue
 - iii) K, L, M are added to the queue
 - iv) Two letters are deleted from the queue
 - v) R is added to the queue
 - vi) One letter is deleted from the queue.



- c) Let a & b denotes positive integers. Suppose a function Q is defined as follows :
- $$Q(a, b) = \begin{cases} 0 & \text{if } a < b \\ Q(a - b, b) + 1 & \text{if } b \leq a \end{cases}$$
- Find the value of $Q(2, 3)$ and $Q(14, 3)$. 5 + 5 + 5
8. a) Transform the following expression to the expression in postfix notation :
- $$A + (B * C - (D / E \uparrow F) * G) * H$$
- b) Why is the queue data structure called FIFO ?
- c) Write the algorithm of binary search & calculate the complexity for best, worst & average cases. 4 + 3 + (5 + 3)
9. a) Write a C language program to find the in-order successor of the root of a binary tree.
- b) What is a B-tree ? Show how the letters A to P of English alphabet can be entered into a B-tree of order 4. 6 + (3 + 6)
10. a) What is inorder threaded binary tree ? Write an algorithm for preorder traversal of a inorder threaded binary tree.
- b) What is an AVL tree ? Discuss the various kinds of rotations done for rebalancing the tree after insertion. Choose suitable example for illustration. 6 + (3 + 6)
11. a) Write recursive and non-recursive 'C' routines for in-order tree traversal. Prove the recursive inorder 'C' routine is efficient over non-recursive inorder 'C' routine.
- b) Write the C program for sorting the list of integers using quick sort algorithm. Obtain the worst case and average case time complexity of this algorithm. Show the trace of the algorithm for following key sequence :
62, 22, 36, 6, 79, 26, 75, 13, 31, 76. 7 + 4 + 4

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