



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2008
DATA STRUCTURE & ALGORITHMS
SEMESTER - 3

Time : 3 Hours]

[Full Marks : 70

GROUP - A**(Multiple Choice Type Questions)**

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) Each element of an array arr[20][50] requires 4 bytes of storage. Base address of arr is 2000. The location of arr[10][10] when the array is stored as column major is

- | | |
|---------|----------|
| a) 2820 | b) 2840 |
| c) 4048 | d) 4840. |

ii) Maximum possible height of an AVL Tree with 7 nodes is

- | | |
|------|-------|
| a) 3 | b) 4 |
| c) 5 | d) 6. |

iii) In a circularly linked list organization, insertion of a record involves the modification of

- | | |
|---------------|----------------|
| a) no pointer | b) 1 pointer |
| c) 2 pointers | d) 3 pointers. |

iv) The in-order and post-order traversal of a binary tree are DBEAFC and DEBFCA respectively. What will be the total number of nodes in the left subtree of the given tree ?

- | | |
|------|-------------------|
| a) 1 | b) 4 |
| c) 5 | d) None of these. |



**GROUP - B****(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. Prove that, the best case time complexity for quick sort is $O(n \log n)$ for input size of n .
3.
 - a) Compare sequential versus direct access file structures.
 - b) Explain multi-index file structure.
4. "The designer of an algorithm need to balance between space complexity and time complexity." — Comment on the validity of the statement in the context of recursive algorithms.
5. What are the advantages of linked list over an array ? Write an algorithm to insert a data X after a specific data item Y in a linked list.
6. Give an algorithm to search for an element in an array using binary search.

GROUP - C**(Long Answer Type Questions)**Answer any *three* questions. $3 \times 15 = 45$

7.
 - a) Why is hashing referred as a heuristic search method ?
 - b) What is the primary advantage of hashing over deterministic search algorithms ?
 - c) Define collision. Discuss two collision resolution techniques and compare their performances.
 - d) Why the hash functions need to be simple ?
8.
 - a) What is linear data structure ?
 - b) Do you consider the following data-structures as linear ?
 - i) Circular doubly linked list
 - ii) Binary tree.

Explain for both cases.
 - c) Represent the following polynomial by linked list (show the diagram only) :
 $9x^5 + 3x^3 - 8x + 15$.
 - d) Write an algorithm to delete all nodes having value greater than X from a given singly linked list.



9. a) Define circular queue.
 b) Write an algorithm to insert an item in circular queue.
 c) What is input restricted dequeue ?
 d) Write an algorithm to convert an infix expression to postfix using stack.

$$2 + 5 + 2 + 6$$

10. a) What do you mean by external sorting ? How does it differ from internal sorting ?
 b) Write an algorithm for sorting a list numbers in ascending order using selection sort technique.

- c) Describe Kruskal's minimal spanning tree algorithm. $3 + 7 + 5$

11. a) In a 2-tree, if E be the external path length, P be the internal path length and Q be the number of vertices that are not leaves, then prove that

$$E = P + 2Q.$$

- b) What is threaded binary tree ?
 c) Write an algorithm to delete a node from a binary search tree.
 d) Create a AVL tree by inserting the following numbers in the order in which they are given : 17 25 19 23 75. Draw figure for each step.

$$5 + 1 + 6 + 3$$

END