

**END-TERM EXAMINATION
SECOND SEMESTER [MCA] – MAY 2004
DATA STRUCTURE**

Paper Code: MCA-102

**Time: 3 Hours
Marks: 60**

Q. 1 (a) What is difference between Big-O and Small-O notation. Define them. 4

(b) Give an example of algorithm that has following complexity (in terms of Big-O). 4

(i) $O(1)$ (ii) $O(N)$

(iii) $O(N^2)$ (iv) $O(n \log n)$

(c) Algorithm 1 does a particular task in time N^3 where N is no. of elements processed. Algorithm 2 does same task in time $3N + 1000$. 4

(i) What are Big-O requirement of each algorithm.

(ii) Under what conditions, if any, would the 'less efficient' algorithm executes more quickly than 'more efficient' algorithm?

Q. 2 (a) Write a procedure to print elements of a singly linked list in reverse order while traversing it only once. 6

(b) Let a queue be implemented as a circular linked structure with an external pointer accessing the 'rear' element: 6

(i) Draw a sketch of such a queue with one node.

(ii) Write a algorithm for insertion and deletion.

Q. 3 (a) Write an algorithm to implement selection sort. 7

(b) Sort the following numbers (Showing each iteration) using 5 Quick Sort :- 57, 73, 43, 77, 83, 63, 87.

Q. 4 Write a algorithm to convert infix expression to postfix expression using stack. Also, write an algorithm to evaluate postfix expression. 12

Q. 5 Define sparse matrix. Implement sparse matrix as an array. Give an algorithm to transpose a sparse matrix for this implementation. 12

Q. 6 (a) What do you mean by file organization? Differentiate between sequential, hashed and random file organization. 6

(b) What is aim of hashing? What are different hashing techniques? What are the problems encountered in them and how to overcome them. 6

Q. 7 (a) Write a algorithm for topological sort of a graph. 7

(b) Taking an example of a graph. Show how breadth first search operates on this graph. 5

Q. 8 Write short notes on any three of the following :- 3 x 4

- (a) Balanced Merge sort
- (b) Critical path
- (c) B+ tree
- (d) B-tree

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