Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Sc.(IN-Sc.)/SEM-1/MI-102/2009-10

2009

DATA STRUCTURE WITH C/C++

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.

Graph(s) will be provided by the institution.

Answer any *five* questions by taking at least *two* from *Group - A* and at least *one* each from *Group - B & C*.

GROUP - A

1.   a)   Write down the properties of an algorithm.

   b)   What do you mean by time complexity and space complexity of an algorithm ?

   c)   Define Big-Theta (Θ) notation. Give diagram.

   d)   Show that $5 n^2 + 10 n + 5 = \Theta (n^2)$.

                                          3 + 4 + 3 + 4

2.   a)   Write down an algorithm for Quick Sort Method.

   b)   In what situation Quick Sort Algorithm give the worst running time ?

   c)   What do you mean by non-comparison based sorting algorithm ? What are their importance ?
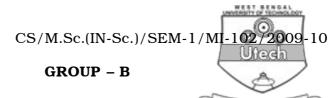
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d) Discuss Brinary Search Algorithm by mentioning its power and weakness.

e) What do you mean by divide and conquer algorithm ? Give examples. 4 + 2 + 2 + 4 + 2

3. a) What do you mean by almost complete binary tree ? Give one application of almost complete binary tree.

b) Show that the total number of nodes in a complete binary tree of depth d is ($2^{d+1} - 1$).

c) Write an algorithm for In-order Traversal of a binary tree.

d) Define a Binary Search Tree. Give example.

e) What do you mean by Internal node and External node of a tree ? 3 + 3 + 4 + 2 + 2

4. a) Define a Graph.

b) Discuss Adjacency Matrix and Adjacency List Representation of a Graph. Give examples.

c) Write down an algorithm for Depth-First-Search in a Graph.

d) Find the complexity of the algorithm you have presented in the previous question. 2 + 4 + 5 + 3

GROUP – B

5. a) Suppose POLY1 and POLY2 are polynomials which are stored as a single link list. Write a procedure ADD (COEF, EXP, LINK, POLY1, POLY2, AUVAIL, SUMPOLY) which finds the sum of POLY1 and POLY2.

7

b) Write a program to accept an input string of an arithmetic expression in Infix and print the Postfix forms of that given input string. 7

6. a) Write an algorithm for inserting a new singly link list node at the end in 0 (1) time complexity. 4

b) Each element of an array DATA [20] [21] requires 5 bytes of storage. Base address of DATA is 2000. Determine the location of DATA [10] [10] when the array is stored as ($b.1$) ROW major and ($b·2$) column major. Lower bound of the row & column are 0. 4

c) Write an algorithm for inserting a new node in a link list in ascending order. 6

GROUP - C

7. a) What is Sparse Matrix ? Write an algorithm for transpose of a Sparse Matrix. 2 + 4

b) Write an algorithm for inserting a new doubly link list node after a specified element. 6

c) Differentiate between ADT and algorithm. 2

8. a) What is need for hashing ? What is double hashing ? How do you resolve the collision ? 2 + 2 + 3

   b) Write a two subprogram (Algorithm)

   INSERT-DIVISION (Info, Link, Key, hash, New, PTR) which use division remainder method and your algorithm should resolve the possible HASH collision. 7

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