Total number of printed pages – 8 B. Tech / MCA BCSE 3102 / PCS 1001/PCS 1002

Second Semester Examination – 2008

DATA STRUCTURE USING C

Full Marks - 70

Time: 3 Hours

Answer Question No. **1** which is compulsory and any **five** from the rest.

Figures in the right hand margin indicate marks.

- 1. Answer the following questions : 2 × 10
 - (a) Define data structure. What do you mean by ADT ? Define and differentiate between linear and non-linear data structures.
 - P.T.O.

- (b) State applications for which binary tree is most suitable. Explain representation of binary tree in linear array.
- (c) Describe ADT representation of queue with commonly used functions.
- (d) Write the conditions to test "Queue is Empty", "Queue is Full", and "Queue Contains ≥ 1" for a linear queue implemented in linear array.
- (e) Explain the data structure used to represent a sparse matrix.
- (f) Why do you have to check the full and empty conditions of a STACK (implemented in linear array) ?
- (g) Define with example Height Balance Tree.What is the worst cases height of such tree ?
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- (h) What is a symbol table ? Which data structure is most suitable to represent symbol table and Why?
- What is path matrix of a Graph? Discuss (i) with relevent example.
- What is the process of topological sorting? (j) Explain how time complexity of topological sorting algorithm, depends on the data structure used to represent the graph.
- 2. Why do you have to check the full and (a) empty conditions of a STACK ? Write a C program to perform insertion and deletion in STACK that implemented using 5 an array.
 - (b) Write a C program to convert a singly linked list to circular linked list. Why header node is used in circular list? 5
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- 3. Define linear queue. Let **QUEUE** be a (a) nonempty Queue implemented using linear array. Write a C program to delete m elements from the **QUEUE**. 5
 - Sketch the binary search tree resulting (b) from the insertion of the following integer keys: 39, 24, 12, 11, 43, 73, 26, 35, 29, 13, 6 5
 - Is the tree almost complete ? (i)
 - Is the tree a AVL ? (ii)
 - (iii) What is the height of the sketched tree ?
 - (iv) Write the PREORDER traversal of the sketched tree.

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Write an algorithm that computes the 4. (a) number of elements and sum of elements in a linear linked list. 5 BCSE 3102 / PCS 1001/PCS 1002

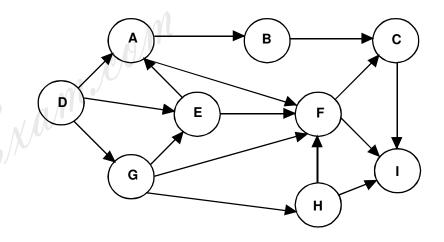
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- (b) The in-order traversal of a tree produced the sequence D, B, H, E, A, I, F, J, C, G and the pre-order traversal of the same tree produced A, B, D, E, H, C, F, I, J, G. Draw the binary tree. Give a linear array representation of the above binary tree. Define a Node structure in C, which can be used to implement a tree.
- (a) Describe a node structure of a doubly linked list. Write an algorithm to delete the last node of a non-empty doubly linked list.
 - (b) Define binary Heap. Explain the process of Heap sort. Write an general algorithm to construct a min heap. Construct minheap from the following list.

{ 21, 6, 56, 61, 44, 7, 9, 76, 75, 32, 34, 4, 49, 33 } 5

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6. (a) Define a Graph. What are the different representations of a Graph ? Use suitable data structures to represent the following directed graph in memory.



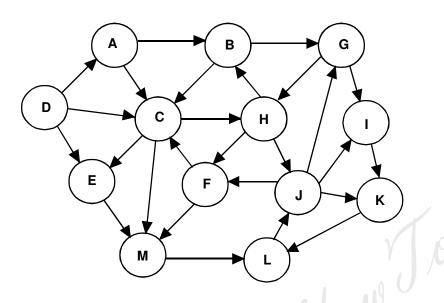
 (b) What are the preconditions to perorm BINARY SEARCH on a linear array ?
Write a recursive function in C to perform binary search on a linear array.

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Contd.

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7. (a) Write an algorithm to perform DFS on a graph. Find out the path from D to K using DFS.5



- (b) Write a program in C to sort a list of floating point numbers (stored in a linear array) using quick sort. In quick sort, why the pivot is chosen from the center of the list rather than from one end ? 5
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8. (a) Use linked list to represent the following polynomial

P (x, y, z) =
$$2xy^2z^3 + 3x^2yz^2 + 4xy^3z + 5x^2y^2 + 8xy^2z^5 + 19$$
 2.5

- (b) Describe the data structure used to represent a General tree. 2.5
- (c) Define circular queue. Sketch to explain the placement of FORNT and REAR pointers when Queue is Full and Queue Containing single element.
- (d) Covert the following infix expression to post fix expression using STACK 2.5

 $(C - D) + (E \not F) + F / (H + W) * A \not FB.$

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