D 28051 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, JANUARY 2007

Computer Science

CS 102—ADVANCED DATA STRUCTURES

(2005 admissions)

Time : Three Hours **Maximum : 80 Marks**

Part A

Answer any **five** *questions.*
Each question carries **8** *marks.*

1. *(a)* **What are disadvantages of linear queue ? How are they overcome in circular queue ?**

   (b) What are the various queue operations ? Explain.

2. **Write an algorithm to insert an element and delete an element from a singly linked list.**

3. **(a) Show that the maximum number of nodes in a binary tree of height** h **is** $2^{h+1} - 1$.

   (b) Give *two* **applications for Directed Acyclic Graphs.**

4. **Explain the following**

   (a) Reference counts.

   (b) AA-Trees.

   (c) Hashing.

   (d) Binary tree.

5. **(a) What are graphs ? Give various representation of graphs.**

   (b) Write procedures for various operations on stacks.

6. **(a) What are the advantages and disadvantages of doubly linked list over singly linked list ?**

   (b) Present an algorithm which checks whether a given +ve integer number is a Fibonacci or not. Obtain an exact computing time.

7. **(a) Explain leftist heaps.**

   (b) Prove that the maximum number of nodes of a binary tree of depth k **is** $2^k - 1$.

(5 x 8 = 40 marks)

Part B

Answer any **four** *questions.*
Each question carries **10** *marks.*

1. (a) Write a function to insert and delete elements in a queue.

   (b) What is the number of distinct binary trees that can be constructed from n nodes ?

2. (a) Write a nonrecursive function to reverse a singly linked list in 0 (N) time.

   (b) Write a procedure to insert a node in a linked list method.

Turn over

3. **(a) Explain what is meant by a hashing function.**

   (b) Explain different probing techniques.

4. **(a) Write an algorithm to count the leaf nodes in a binary tree.**

   (b) What are the properties of Red-Black trees ? Give the algorithm for insertion for Red-Black trees.

5. **(a) Propose an algorithm to insert M nodes into a binary heap on N element 0 (M + log N log log N) time.**

   (b) Explain skew heaps and Fibonacci heaps.

6. **(a) Write an algorithm for deleting an element in a circular linked list.**

   (b) Design a recursive linear-time algorithm that tests whether a binary tree satisfies the sear tree order property at every node.

(4 x 10 = 40