NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
MAY EXAMINATIONS 2005

SUBJECT: ADVANCED PROGRAMMING
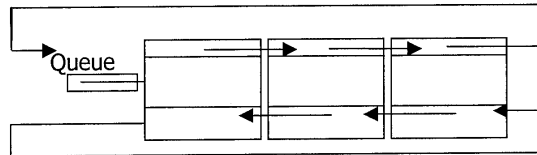**CODE:**   **SCS4105**

INSTRUCTION TO CANDIDATES

Answer any five questions. Paper contains Seven questions.

Time: 3 hours

QUESTION ONE

Demonstrate how you would implement a queue structure based on the following arrangement: Include the following operations: enqueue(int), int dequeue(), boolean isEmpty(), and void display(), int getHead().

[20]

QUESTION TWO

Write a Java program that implements a static circular queue. This queue should include the following operations as a minimum: void enqueue(int), int dequeue(), boolean isFull(), boolean isEmpty() and void display().

[20]

QUESTION THREE

Write a static implementation of a binary search tree. This tree structure must be capable of storing a number of type double in each node. Include the following operations:
int search(int) which returns the location in the array of the parameter, -1 otherwise,
void preorder(), void postorder(), voidinorder(),
An insert operation.   [20]

QUESTION FOUR

a)   Compare and contrast the performance of a binary search tree and an
      AVL Tree.   [4]
b)   Write down all the instance variables necessary for an AVL Tree node, and
      explain why each one of them is necessary.   [6]
c)   Implement the insert operation into an AVL tree.   [10]

QUESTION FIVE

Given a linked list with nodes having the following instance variables:
        private int data;   // An item in the list.
        private ListNode next; // reference to the next node

Write a method that will make a copy of a list, with the order of the items of the list reversed. The method should have a parameter object of the class ListNode, and it should return an object of the class ListNode. The original list should not be modified. You should also write a main() method to test your method. [20]

QUESTION SIX

Write a method that implements the following algorithm, and write a program to test the method. Note that you will need a queue of TreeNodes, so you will need to write a class to represent such queues.
Add the root node to an empty queue
          while the queue is not empty:
          Get a node from the queue
          Print the item in the node
          if node.left is not null:
                add it to the queue
          if node.right is not null:
                add it to the queue

[20]

QUESTION SEVEN

Write a Java application to implement a binary search tree. The program should include the following operations: insert, search, delete, preorder, inorder, postorder and count (to return the number of nodes in the tree).

[20]

END OF QUESTION PAPER