

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
FACULTY OF APPLIED SCIENCE  
**COMPUTER SCIENCE DEPARTMENT**  
JULY SUPPLEMENTARY EXAMINATIONS 2005

SUBJECT: OBJECT ORIENTED PROGRAMMING II  
CODE: SCS5201

**INSTRUCTION TO CANDIDATES**

Answer any 5 questions  
Include a UML class diagram for all classes  
All programs must be written in Java

**Time: 3 hours**

**QUESTION ONE**

Write a Java program that implements a static list of integers. Include the following operations: void append(int), void delete(int), void display(), boolean isEmpty() and int count() which returns the number of elements in the list.

[20]

**QUESTION TWO**

- a) What is the difference between a Binary Search Tree and an AVL tree. [4]  
b) Show the instance variables and interface for a node that belongs to a Binary Search tree. [4]  
c) Show the instance variables and interface for a node that belongs to an AVL Tree. [4]  
d) Demonstrate how an AVL tree grows if the following sequence is inserted into an empty tree.  
90, 1, 78, 3, 8, 4, 65, 43, 32, 2, 90, 76

[8]

**QUESTION THREE**

Write a program that implements a static circular queue arrangement. Include methods that implement the following operations in your program: enqueue, dequeue, display, isEmpty and one that returns the number of items in the queue.

[20]

#### QUESTION FOUR

- a) What is the purpose of hashing? [4]
- b) Explain linear probing and quadratic probing. [4]
- c) Write code to implement insertion into a hash table using the linear probing and quadratic probing. [8]
- d) Which of these approaches is more efficient, and how is this efficiency measured? [4]

#### QUESTION FIVE

Write a program that implements a static stack of integers. Include the following operations: void push(int), int pop(), int top() and int stackSize(). [20]

#### QUESTION SIX

Write a program that implements a dynamic binary search tree of integer data items. Include the following operations: insert, preorder, inorder, postorder, and search. [20]

#### QUESTION SEVEN

Write a java method that accepts as a parameter a reference to a dynamic linked list of integers, which returns a reference to a dynamic linked list of integers. The returned list should contain keys in the reverse order to those in the original list. [20]

END OF QUESTION PAPER