

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

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

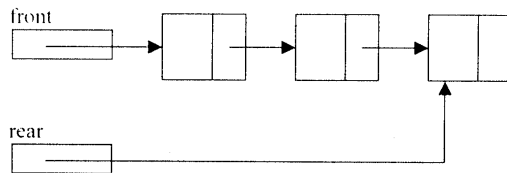
INSTRUCTION TO CANDIDATES

Include UML class diagrams whenever possible in your response.
Write all code in Java.
Answer any 5 questions

Time: 3 hours

QUESTION ONE

Write a program that implements a queue structure based on the arrangement in the diagram below. The empty queue is represented when the variables `front` and `rear` both have the value `null`. Include the following operations: `void enqueue(int)`, `int dequeue()`, `boolean isEmpty()`, and `void display()`, `int getLead()`.



[20]

QUESTION TWO

Write a program that implements a dynamic binary search tree. Include the following operations in your implementation: `void inorder()`, `void postorder()`, `void preorder()`, `void insert(int)`, `int count()`, which returns the number of nodes in the binary search tree.

[20]

QUESTION THREE

Given a linked list, with nodes that have two data elements as follows:

```
private int data;  
private LinkedListNode next;
```

Write a program that includes the following operations: void append(int), void display(), void prepend(), LinkedListNode reverse(), which returns a copy of the list with the elements reversed.

[20]

QUESTION FOUR

Include in your responses suitable UML class diagrams, including appropriate instance variables and method headers. Provide concise explanations regarding these variables and methods.

a) Explain the difference between a binary search tree and an AVL tree.

[10]

b) Explain the difference between an AVL tree and a BTree.

[10]

QUESTION FIVE

a) What is the meaning of the term hashing?

[4]

b) What are the implications of collision resolution.

[4]

c) Write code to implement insertion into a hash table using two approaches to collision resolution.

[8]

d) Explain which of these two approaches is more efficient?

[4]

QUESTION SIX

a) Demonstrate how the structure of a BTree of order 2.3 will be modified as the following sequence of keys is inserted into the structure:

15, 1, 6, 4, 7, 2, 29, 56, 3, 4, 20

[10]

b) Demonstrate how the structure of an AVL tree will be modified as the following sequence of keys is inserted into the structure:

15, 1, 6, 4, 7, 2, 29, 56, 3, 4, 20

[10]

QUESTION SEVEN

Implement a static stack arrangement to store integer data items. Ensure that the following operations are included: void push(int), int pop(), int top(), and boolean isEmpty(). [20]

END OF QUESTION PAPER