

York University
AS/AK/ITEC 1630 3.0
OBJECT-ORIENTED PROGRAMMING
December 20, 2006
Final Exam

Duration: 180 Minutes

This exam is closed textbook(s) and closed notes.

Use of any electronic device (e.g., for computing and/or communicating) is NOT permitted.

Do not un-staple this test book – any detached sheets will be discarded.

Answer all questions in the space provided. No additional sheets are permitted.

Work independently. The value of each question is indicated. The total value of all questions is 100.

Write your section letter, your name and student number in the space below.

NOTE: YOU MAY USE PEN OR PENCIL, BUT ANSWERS IN PENCIL WILL NOT BE CONSIDERED FOR RE-GRADING.

Surname: _____

Given Names: _____

Student Number: _____

Part A (max.18) _____ **Part B (max.12)** _____ **Part C (max.25)** _____

Part D (max.45) _____ **TOTAL (max.100)** _____

Part A: Multiple Choice (18 marks)

Circle the correct answer. Only one answer is accepted (which you consider the best).

1) The Linked Lists are data structures in which objects are stored in random memory locations.

- a) TRUE
- b) FALSE

2) If you redefine an attribute in a subclass class, the new attribute value will not replace the superclass value.

- a) TRUE
- b) FALSE

3) The method used to schedule a thread for execution is start().

- a) TRUE
- b) FALSE

4) With datagram sockets, the communication is like the telephone system.

- a) TRUE
- b) FALSE

5) Private attributes defined in a superclass can be accessed directly inside a subclass.

- a) TRUE
- b) FALSE

6) The method accept() is used for the creation of a Socket on a server application.

- a) TRUE
- b) FALSE

7) Multiple inheritance can be implemented in Java using interfaces.

- a) TRUE
- b) FALSE

8) In an inheritance situation, a reference of a subclass type can be used to point to an object of the base class type.

- a) TRUE
- b) FALSE

9) Polymorphism can be implemented with interfaces or with abstract classes.

- a) TRUE
- b) FALSE

10) What should you use to position a Button within an application Frame so that the size of the Button is NOT affected by the Frame size?

- a) FlowLayout
- b) GridLayout
- c) the center area of BorderLayout
- d) the East or West area of a BorderLayout
- e) the North or South area of a BorderLayout

11) What might cause the current thread to temporarily or permanently stop executing ?

- a) An InterruptedException is thrown.
- b) The thread executes a wait() call.
- c) The thread constructs a new Thread.
- d) A thread of higher priority becomes ready.
- e) answers (a) and (b)
- f) answers (a), (b) and (d)
- g) None of above

12) Given a TextField that is constructed like this:

```
TextField t = new TextField(30);
```

Which statement is true?

- a) The displayed width is 30 columns.
- b) The displayed string can use multiple fonts.
- c) The displayed string will always show thirty characters.
- d) The maximum number of characters in a string will be thirty.

13) Where in a constructor, can you place a call to a constructor defined in the super class?

- a) Anywhere
- b) The first statement in the constructor
- c) The last statement in the constructor
- d) You can't call super in a constructor

14) Which type of file will the following input stream connect to ?

```
FileReader fr = new FileReader("client.dat");
```

- a) Text file
- b) Sequential file
- c) Random-access file
- d) any type of file

15) Images are stored in:

- a) Text files
- b) Binary format
- c) Both (a) and (b)
- d) None of the above

- 16) The code which creates the synchronization of threads (such as in the Producer/Consumer example) uses a number of techniques. Indicate which of the following techniques does NOT play a role in creating the synchronization.
- method sleep()
 - method wait()
 - method notify()
 - a boolean variable to ensure synchronization
 - the use of the reserved word “synchronized” in specifying the synchronized methods
- 17) Which of the following methods is NOT inherited from the Object class:
- method clone()
 - method toString()
 - method equals()
 - method println()
- 18) Which of the following JApplet methods is NOT called automatically.
- method start()
 - method paint()
 - method repaint()
 - method init()
 - method stop()

Part B (12 marks): Data Structures

B1 (6 marks)

Fill in the code for the method insertAtFront() missing at the end of the Linked Lists code shown below.

```
class ListNode {
    // package access data so class List can access it directly
    Object data;
    ListNode next;

    // Constructor: Create a ListNode that refers to Object o.
    ListNode( Object o ) { this( o, null ); }

    // Constructor: Create a ListNode that refers to Object o and
    // to the next ListNode in the List.
    ListNode( Object o, ListNode nextNode ) {
        data = o;    // this node refers to Object o
        next = nextNode; // set next to refer to next
    }

    // Return a reference to the Object in this node
    Object getObject() { return data; }

    // Return the next node
    ListNode getNext() { return next; }
}
```

```
}
```

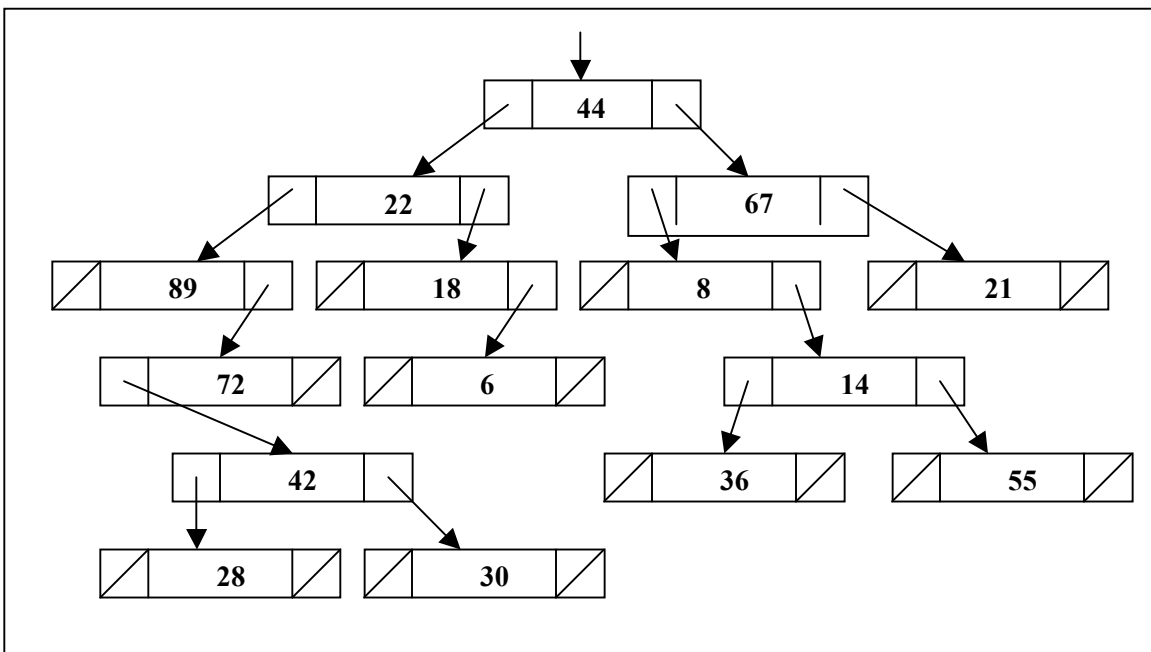
```
// Class List definition
```

```
class List {  
    private ListNode firstNode;  
    private ListNode lastNode;  
    private String name;  
  
    public List( String s ) {  
        name = s;  
        firstNode = lastNode = null;  
    }  
    public List() { this( "list" ); }  
    public synchronized boolean isEmpty() { return firstNode == null; }  
  
    public synchronized void insertAtFront( Object insertItem ) {
```

```
}
```

B2. (6 marks)

Consider the following binary tree:



Write the output of a program that performs an *inorder* traversal of the tree. Here is the method used by the traversal:

```
private void inorderHelper( TreeNode node ) {
    if ( node == null )
        return;
    inorderHelper( node.left );
    System.out.print( node.data + " " );
    inorderHelper( node.right );
}
```

Output for inorder traversal:

Part C (25 marks): Programming

Suppose that a university stores its employee records in the random access file Univ.dat. Each record contains: the employeeID (an integer up to 10000), the telephone number (String of 12 characters), job title (String with 10 characters) and the years of work (an integer).

Write a Java program containing class UpdateEmp which enters the existing records (i.e. records with non-zero employeeID) in an array of records, sorts them in ascending order by the years of work and then displays all records.

Assume that class Record is provided (methods content is missing)

```
public class Record {
    private int employeeID;
    private String phone;
    private String title;
    private int years; // i.e. years of work

    public Record(int a, String f, String l, double b) {... }
    public Record() {... }
    public void read( RandomAccessFile file ) throws IOException {... }
    public void write( RandomAccessFile file ) throws IOException {... }
    public int getID(){...}
    public String getPhone(){...}
    public String getTitle(){...}
    public double getYears(){...}
    public int size() {... }
    public String toString() {... }
}
```

Help: Several useful methods of the RandomAccessFile are
length() – returns the length of the file in bytes
getFilePointer() – returns the position (in bytes) of the file pointer inside the file

Part D (45 marks): Programming (Write the missing code)

D1 (23 marks)

Write a Java server application for a retail company using a chain of stores. The server is installed on a Web server at the address `www.kmart.com` and uses for communication port 8453. If a client attaches to that port, the server will wait for the client to send a UTF-style string, containing the name of an item sold by a store. Whenever this happens the server does a search in its database and sends back a UTF string containing the cost of the item.

You have to write the code for this server able to simultaneously communicate by socket technology with up to 500 clients. Do not write the database code - assume that the method `String database (String item)` returns the cost of the item as a string.

D2 (22 marks)

Write a Java client applet for the server of point D1, which has the following GUI:

- At the top it has the label "Welcome to KMart"
- At the center it has a 3 pairs label-textfield and a button. The labels are: "Client Number", "Item Name" and "Number of Items". The button has the label "Send".
- At the bottom of the applet there is a text area.

When button "Send" is clicked the Item Name stored in the second textfield is sent to the server and the price returned is used to calculate the cost of all items. Then the information from the textfields plus the cost of all items are appended to a string which is displayed in the textarea and the textfields become blank.

Write this applet such that the communication with the server starts when the user enters the webpage and stops when the user leaves the webpage.