**Carleton University**

**Department of Systems and Computer Engineering**

**SYSC-2004 Object-Oriented Software Development Winter 2003**

**MidTerm Test 1 : Sections B & C**

Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Number : \_\_\_\_\_\_\_\_\_\_\_

Mark : \_\_\_\_\_\_\_\_\_\_/ 25

* The exam is closed book. No aids are allowed.
* The paper is not to be taken from the classroom

**Question 1** [9 marks]

Managing dates is a common problem in applications. Java provides a class called Calendar\*. Calendar objects represent a date, given by integer triplet [year,month,day] (for example, [2003,01,24] represents February 24, 2003). Two constructors are provided : the default constructor that initializes the object to the current date (ie. today), and a 3-arg constructor that initializes the object to a specific date. The standard accessors are provided but no mutators are defined. Instead, four operations are provided : (1) a test whether another date is before this one (2) a test whether another date is after this one and (3) adding “n” days to this one and (4) subtracting another date from this one to return the number of days difference.

Analyze this description and draw the UML for the Calendar class, showing all state variables, constructors and methods mentioned above. NO CODE IS REQUIRED.

You do NOT have to show the standard methods toString() and equals().

\* Some parts of the Calendar class have been changed to keep the question small.

**Question 2** [16 marks]

Nowadays, libraries not only loan out books, but they also loan out videos. All of these items can be borrowed, although the borrow period is different : books are typically 14 days whereas videos are often 2 days. The fines for videos are also more expensive than for books. The items in a library are represented by the following inheritance hierarchy.

Item

+AVAILABLE:int=0

+ON\_LOAN:int=1

-title:String

-status:int // AVAILABLE or ON\_LOAN

-dueDate:Calendar // null when not ON\_LOAN

#finePerDay:int // dollars

#loanPeriod:int // number of days

+Item(title:String)

+getTitle():String

+getStatus():int

+borrowItem():Calendar

+returnItem()

#calculateFine():int

+toString():String

+equals(o:Object):boolean

if (status != AVAILABLE)

return null;

else {

status = ON\_LOAN;

dueDate = new Calendar().add( loanPeriod );

return dueDate;

}

Video

-DEFAULT\_LOAN\_PERIOD=2

-DEFAULT\_FINE=5

+Video(title:String)

+toString():String

+equals(obj:Object):boolean

Book

-DEFAULT\_LOAN\_PERIOD=14

-DEFAULT\_FINE=1

-author:String

+Book(title:String, author:String)

+getAuthor():String

+toString():String

+equals(o:Object):boolean

1. [3 marks] Write the constructor shown for Book, using the parameters shown and setting all other variables to their *default* initial values.
2. [4 marks] Write the equals() method for Book according to the policy given in the lectures.
3. [5 marks] When an item is returned, the item is marked as available. If the item was returned after the due date, an exception must be raised. Suppose we have a checked exception called LateException with a 1-argument constructor that takes the total fine that was calculated. Write the full implementation of the returnItem() method for the Item class. (Reminder : Calendar’s default constructor initializes an object to “today” ).
4. [4 marks] A library is composed of a generic array of items, some books and some videos, that may be borrowed and returned. A partial skeleton of the Library class is provided :

public class Library

{

private Item items[];

public Library ( ) { .... }

public Calendar borrow(String title)

}

Write the implementation of the borrow() method : Given a title, locate the item in the library collection and borrow it, returning its due date if present, null if not present. Refer to the UML diagram for help.