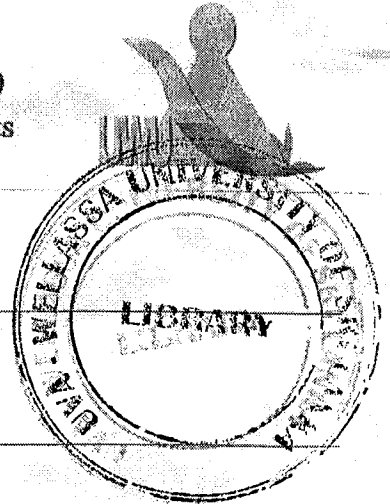


Uva Wellassa University, Sri Lanka  
End Semester Examination – January 2010  
CST201-2 Object Oriented Design Concepts  
and Case Tools

Time: Two (02) hours

Total 06 Questions  
Answer ALL questions



1. I Explain how to declare a two-dimensional array in Java. (3 marks)
- II There are 5 students registered for a course. The course includes 4 quizzes. At the end of the course the instructor finds the average mark of each student and each quiz. Write a program in Java to
- read the marks of quizzes for each student into a two-dimensional array.
  - compute the average mark for each student.
  - compute the average mark for each quiz.
  - display the marks and averages in a table.
- (12 marks)
2. The following program contains errors. Identify them (not necessary to correct). Explain how each error you identified would cause either a syntax error, a runtime error or why it might not do anything sensible. The lines are numbered only for reference purposes.

```
1  /* 1st Semester Exam January 2010 */
2  public Class DemoScore.java
3  {
4      void static public checkScore main(String [teams])
5          begin
6              Mark team = null;
7              for (i=1; i>10; i++)
8                  team = new Score(i, j)
9                  team.print();
10         end;
11     }
```

```
12
13 class Mark
14 {
15     integer hits;
16     Mark(int hits)
17     { this = hits; }
18     public void print()
19     { System.out.println(hits); }
20 }
21
22 class Score extends Mark
23 {
24     Mark first, second;
25     Score(mark f, Mark s)
26     { first = f, second = s;
27     }
28     void print()
29     { first.print();
30     System.out.println("Hits = " , hits);
31     second.print();
32     }
33 }
```

(15 mark)

3. I Explain the following concepts with an example of each :
- (a) Class and Object
  - (b) Encapsulation
  - (c) Inheritance

(10 mark)

- II The UML class diagram given below (Figure 1) shows the inheritance hierarchy of the classes person, teacher and section head in a school.

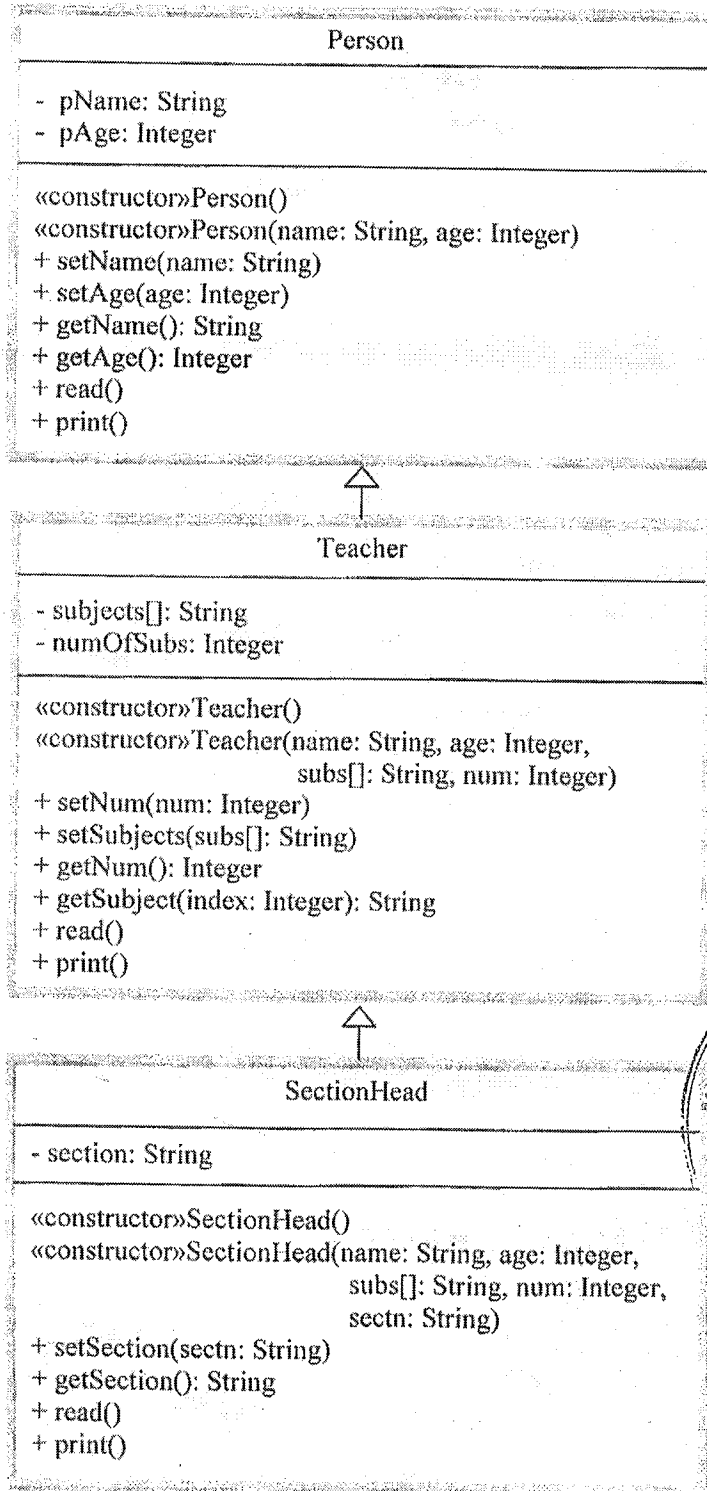
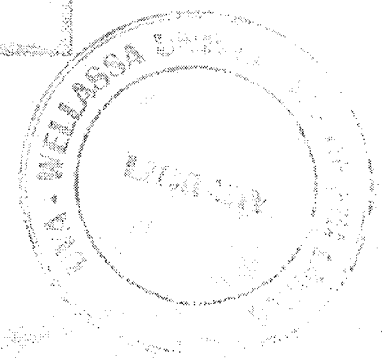


Figure 1: UML class diagram



Implement the classes given in the UML diagram.

The method

```
getSubject(index: Integer): String
```

returns the name of the subject at the given index (passed as a parameter) of the array.

The methods `read()` and `print()`, reads the relevant information into the variables from the keyboard and displays the information on the screen respectively.

**Note:** Write your code in the most object-oriented way possible.

(25 marks)

4. I (a) What is polymorphism? Explain with an example.

(3 marks)

(b) What is runtime polymorphism or dynamic method dispatch?

(2 marks)

II Consider the UML diagram given in Figure 1 in question 3 part II and suppose that the implementations of the classes are available.

Uva College needs a program to maintain the information (name, age, subjects taught and if a section head, then the section) about the teachers in the school. There are five sections in the school and hence five section heads. All together there are 75 teachers.

Using the classes given in question 3 part II, write an application in Java to read the information of the teachers into an array and display the information of the teachers on the screen.

Your program should create an array of `Person` variables to store references to teachers and section heads. In a loop read/display the information (polymorphically). Store the references of section heads as the first five elements of the array.

(10 marks)

5. I What is an exception? Explain, with an example, how exceptions are handled in Java.

(5 marks)

II How the keywords `throws` and `throw` are different? Explain.

(3 marks)

III What is wrong with this fragment?

```
{  
    // some code  
    vals[18] = 10;  
    catch (ArrayIndexOutOfBoundsException exc)  
        // handle error  
}
```

(2 marks)

6. Draw a use case diagram for the following problem:

A bank has several ATM machines. By using the ATM machine, a customer can withdraw cash from either a savings or checking account, or process a query, or transfer funds from one account to another. A transaction is initiated when a customer inserts an ATM card into the card reader. The system validates the ATM card and then checks that the PIN entered by the user matches the PIN maintained by the system. If the PIN validation is successful, the customer is prompted for withdrawal, query or transfer transaction. Before a withdrawal transaction can be approved, the system determines whether sufficient funds available in the account and that sufficient cash available in the cash dispenser in the ATM machine. If the transaction is approved, the requested amount is dispensed, a receipt is printed and the card is ejected. Before a transfer transaction is approved, the system determines that the customer has two accounts and that there are sufficient funds in the account to be debited. For approved query and transfer transactions a receipt is printed and the card is ejected.

An ATM operator may start up and close down the ATM to refill the ATM cash dispenser and for routine maintenance.

(10 marks)

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