



UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING FIRST SEMESTER 2022/2023 [SEPTEMBER-DECEMBER, 2022]

SOEN 305: OBJECT ORIENTED PROGRAMMING II USING JAVA

STREAM: Y3S1

TIME: 2 HOURS

DAY: TUESDAY, 9:00 – 11:00 AM

DATE: 20/12/2022

INSTRUCTIONS

1. *Do not write anything on this question paper.*
2. *Answer question ONE and any other TWO questions.*

QUESTION ONE (30 marks)

- (a) In your words, describe object oriented programming (2 marks)
- (b) What are abstract methods? Describe the circumstances in which an abstract method would be appropriate (2 marks)
- (c)
 - i. Create a class called invoice that a hardware store might use to represent an invoice for an item sold at the store. An invoice should include 4 pieces of information as instance variables; a part number (type string), a part description (type string), a quantity of the item being purchased (type int) and a price per item(double). (5 marks)
 - ii. . Your class should have a constructor that initializes the 4 instance variables. Provide a set and a get method for each of the 4 instance variables. In addition provide a method named getInvoiceAmount that calculates the invoice amount i.e. multiplies the quantity by the price per item, then returns the amount as a double value. If the quantity is not positive, it should be set to 0.0. (5 marks)
 - iii. Write a test application named invoiceTest that demonstrates class invoice's capabilities. (5 marks)
- (d) Explain how:
 - i. The super reference is important to a child class. (2 marks)
 - ii. Inheritance support polymorphism (2 marks)
- (e) Describe the principles of the object oriented paradigm (7 marks)

QUESTION TWO (20 MARKS)

- (a) With relevant example java codes, differentiate between super and this references as used in object oriented programming. (6 marks)
- (b) Create a Person class that includes fields for last name, first name, and zip code. Include a default constructor that initializes last name, first name, and zip code to "X" if no arguments are supplied. Also include a display function. Write a main() function that instantiates and displays two Person objects: one that uses the default values, and one for which you supply your own values. (6 marks)
- (c) With relevant java code examples, differentiate between method overriding and method overloading as used in object oriented programming. (8 marks)

QUESTION THREE (20 MARKS)

- (a) Explain the notion of package access in Java. Explain the negative aspects of package access. (5 marks)
- (b) Explain the three ways in which a java program can be designed to process an exception. (4 marks)
- (c) Explain why a static method cannot refer to an instance variable. (5 marks)
- (f) Study the following simple Java program carefully.

```
class t {
    public static void main(String[] args) {
        int i = 0, m = 0;
        while (i++ < 10) m += i*i;
        StdOut.println(m);
    }
}
```

What does the program do when run? (5 marks)

- (g) Design and implement an application that reads an integer value and prints the sum of all even integers between 2 and the input value, inclusive. Print an error message if the input value is less than 2. Prompt accordingly. (5 marks)

QUESTION FOUR (20 MARKS)

- (a) In an object oriented inheritance hierarchy, each level is a more specialized form of the preceding level. Give an example of a hierarchy found in everyday life that has this property. Illustrate your answer using a diagram. (5 marks)
- (b) What will be the output of the following code? (6 marks)

```
Class Q3Main{
public static void main(String args[]){
    QuestionTFour() q4;
    q4=new QuestionTFour();
    q4.init();
}
```

```

q4.count=q4.increment() + q4.increment();
System.out.println(q4.increment());
}
}
class QuestionTFour(){
public int count;
public void init(){
count=1;
}
public int increment(){
count=count+1;
return count;
}
}
}

```

(c) Discuss the role of a constructor and state any two properties of a constructor. (3 marks)

(d) What does it mean when: (6 marks)

- i. a method is declared final
- ii. a class is defined as final

QUESTION FIVE (20 MARKS)

a) Imagine you are given the task of designing an airline reservation system that keeps tracks of flights for a commuter airline. List the classes you think would be necessary for designing such a system. Describe the data values and methods you would associate with each class you identify.

(8 Marks)

b)

i. Create a class named Student. A Student has fields for an ID number, number of credit hoursearned, and number of points earned. (For example, many schools compute grade point averagesbased on a scale of 4, so a three-credit-hour class in which a student earns an A is worth 12 points.) Include methods to assign values to all fields. A Student also has a field for grade point average. Include a method to compute the grade point average field by dividing points by credit hoursearned. Write methods to display the values in each Student field. (8 Marks)

ii. Write a class named ShowStudent that instantiates a Student object from the class you created. Compute the Student grade point average, and then display all the values associated with theStudent. (4 Marks)