SIM UNIVERSITY

ICT131

Examination – July Semester 2015

Introductory Programming and Object Oriented Concepts Using Java

Saturday, 14 November 2015 **1:00 pm – 3:00 pm**

Time allowed: 2 hours

INSTRUCTIONS TO STUDENTS:

1. This examination contains **FOUR (4)** questions and comprises **FIVE (5)** printed pages (including cover page).
2. You must answer **ALL** questions.
3. This is a Closed Book examination.
4. All answers must be written in the answer book.

At the end of the examination
Please ensure that you have written your examination number on each answer book used.

Failure to do so will mean that your work cannot be identified.

If you have used more than one answer book, please tie them together with the string provided.

THE UNIVERSITY RESERVES THE RIGHT NOT TO MARK YOUR SCRIPT IF YOU FAIL TO FOLLOW THESE INSTRUCTIONS.

Answer all the questions. (Total 100 marks)

Question 1

The program given below is supposed to calculate and display the total cost (inclusive of the 7% GST) for purchasing a number of items in a $1.99 shop where every item is sold at $1.99 per piece. Study the program and answer the questions that follow.

```
1.  public class ExamQ1
2.  {
3.     public static void main(String[] args)
4.     {
5.        final GST_RATE = 7;
6.        final UNIT_PRICE = 1.99;
7.        int quantity;
8.        double cost, gst, totalCost;
9.        System.out.println(Welcome to $1.99 Shop);
10.       quantity = Double.parseDouble(args[0]);
11.       cost = quantity * UNIT_PRICE;
12.       gst = cost * GST_RATE / 100;
13.       totalCost = cost + gst;
14.       System.out.print("Total cost: $", totalCost);
15.       System.out.printf(" (inclusive of $%.2f GST)\n", GST);
16.    }
17. }
```

(a) There are **SIX (6)** errors in the program. Identify all the compilation errors, explain and correct the errors. Give your answer in the following format:

Line number	Explanation of error	Correction of statement (write the whole line)

(12 marks)

(b) It is decided to prompt the user for the quantity after the welcome message is displayed instead of obtaining the input from the command-line argument at the start of executing the program. The Java-supplied class, `Scanner` class, has methods to capture the user input from the keyboard whenever needed. Use the Java-supplied class to re-write the part of the program where the changes are needed with a clear indication of the position where the statements are to be added to.

(6 marks)

(c) The shop has decided to give 10% discount for the total bill for customers who purchase more than 10 pieces and 20% discount for the total bill for those who purchase more than 20 pieces. Modify the program so that the discount is handled. You are not required to write the whole program but just show the changes needed with a clear indication of the position where the statements are to be added to.

(7 marks)

Question 2

Examine the program given below and answer the questions that follow.

```
1.  import java.util.*;
2.  public class Exam_Q2b
3.  {
4.     public static void main(String[] args)
5.     {
6.        String sInput, sResult="";
7.        int firstLetter, sLen;
8.        Scanner input = new Scanner(System.in);
9.        System.out.print("Enter a string: ");
10.       sInput = input.nextLine();
11.       sLen = sInput.length();
12.       firstLetter = Integer.parseInt(""+sInput.charAt(0));
13.       if (firstLetter%2 == 1)
14.       {
15.          for (int i=3; i<sLen; i+=3)
16.              sResult += sInput.charAt(i);
17.       }
18.       else
19.       {
20.          for (int i=4; i<sLen; i+=4)
21.              sResult += sInput.charAt(i);
22.       }
23.       if (sResult.length() == 0)
24.          System.out.println("The input string is too short");
25.       else
26.          System.out.println("The new string is " + sResult);
27.    }
28. }
```

(a) State the purpose of the statement at line 11.

(2 marks)

(b) State the purpose of the statement at line 12.

(2 marks)

(c) Consider the boolean expression `firstLetter%2 == 1` in line 13. Indicate the possible values of `firstLetter` for the condition to be true.

(2 marks)

(d) Assume that the input entered by the user is "3SIM University" (excluding the double quotes). Outline the output produced by the program by tracing through the program and show the value of each and every variable at each iteration.

(9 marks)

(e) List the output produced by the program if the user input is "2SIM" (excluding the double quotes).

(2 marks)

(f) There will be a run-time error if the first letter of the input string is not a digit '0' through '9'. Develop the segment of program using the control structures that validates the input data to ensure that the first letter of the input string is a digit '0' through '9'. The program should display an error message if an invalid data is

entered. Repeat the input process until the user enters a valid data. You are not required to write the whole program but just show the changes needed with a clear indication of the position where your code segment is to be added to.

(8 marks)

Question 3

Develop a simple application system to manage the children's height in a childcare centre. The system should record the name and height of each child. For simplicity, you may assume that the maximum number of children in the childcare centre is 100 and each child has a unique name.

(a) Write Java statements that declare and create two arrays, where one is used to store the names of the children and the other one to store the height of the children.

(4 marks)

(b) Write a Java method with the following method signature:

```
public static int countTallChildren(double[] heightArr, int count)
```

This method counts and returns the number of children who are above 1.2m.

Parameters: `heightArr`: the array that stores the height of the children
`count`: the actual number of children in the system at the moment

(7 marks)

(c) Write a Java method with the following method signature:

```
public static int searchTallestChild(double[] heightArr, int
count)
```

This method returns the index of the tallest child in the childcare centre. If there are two or more children with the same tallest height, the method should return the index of the first child found.

Parameters: same as in Question 3(b) above.

(7 marks)

(d) Write a Java method with the following method signature:

```
public static void printTallestChild(String[] nameArr,
                                double[] heightArr, int count)
```

This method prints the name of the tallest child in the childcare centre with appropriate description. You are required to make use of the method defined in Question 3(c) above.

Parameters: `nameArr`: the array that stores the names of the children
`heightArr` and `count`: same as in Question 3(b) above.

(5 marks)

(e) Explain why arrays are used in this application.

(2 marks)

Question 4

(a) A school has asked you to develop a system using the object oriented programming approach for a contest. Each contesting team has a unique team name. There are 3 judges awarding the score for the contest. The scores are whole numbers in the range of 1 to 100 (100 being the best score while 1 being the worst score). The final score of the team is based on the average score from the 3 judges. The contest also takes into consideration the audience choice. Teams with more than half of the audience votes will score another 20% above their final score.

Example:
Team "Fantasy X" has the score of 60, 70 and 80 from the three judges. If they did not get more than half of the audiences' votes, their final score will be (60 + 70 + 80) / 3 = 70. On the other hand, if they get more than half of the audiences' votes, their final score will be (60 + 70 + 80) / 3 * 1.2 = 84.

Implement a Java class called `Team`. Your implementation must include the following:

- A suitable instance variable for each of the information listed above.
- A constructor that creates a `Team` object with the given team name.
- The accessor methods for the instance variables.
- The `calculateFinalScore()` method that calculates the final score for the team.
- A `toString()` method that returns the values of the instance variables.

(15 marks)

(b) Develop a `Tester` class. Write a tester program using the class to test the `Team` class written in Question 4(a) above. The following should be done in your class:

- Create 2 `Team` objects with the team names `"Fantasy X"` and `"The Alien"`.
- Set the values for the instance variables according to the data given in Table Q4(b) below:

Name	scores			More than half of audiences' votes
	Judge 1	Judge 2	Judge 3	
Fantasy X	60	70	80	yes
The Alien	80	85	77	no

Table Q4(b)

- Calculate the final score of the two teams.
- Display the attribute values of the two teams together with their final scores.
- Display the name of the team that has the higher score.

(10 marks)

----- END OF PAPER -----