Rajarata University of Sri Lanka
Faculty of Management Studies, Mihintale

2018, B.Sc. (Business Information Technology) Special Degree

ITM 2133 - Introduction to Programming
Special Assignment

Due Date: 03.06.2021
No. of Questions: 07
No. of Pages: 04

Instructions:

- Answer all questions.
- Keep a separate folder of the question number for each major question.
- Assemble the subfolders into a single folder named *MGT_2018_XXX*, where *XXX* indicates the last three digits of your registration number and upload a *zip* file to the location provided in the LMS.
- You are highly recommended to submit the answer file on or before the examination date of this subject.

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1. Write java programs for followings.
   i. Print as '*Rajarata University of Sri Lanka*' on the screen.

   [02 Marks]

   ii. Print as '*Rajarata University of Sri Lanka*' and '*Mihintale*' in separate lines but with a single print statement.

   [03 Marks]

   iii. Take two numbers as input form command line argument and display the product of those two numbers.

   [05 Marks]
   [Total 10 Marks]

2. Write java programs to print the results of the following operations. Make sure to declare variables with suitable data types for operands and answers.
   i. 5 + 8 * 6

   [02 Marks]

   ii. (55 + 6) % 9

   [02 Marks]

   iii. 3.6 – 2.4 / (8 * 0.2)

   [02 Marks]

   iv. 20 + 3 * 5 / 2.5

   [02 Marks]

   v. 5.2 + 15.6 / 3.3 * 2.8

   [02 Marks]
   [Total 10 Marks]

3. A leap year is exactly divisible by 4 except for century years (i.e. years ending with 00). The century year is a leap year only if it is perfectly divisible by 400.

   Write a java program to take a year as user input and determine whether the given year is leap year or not. The output shall display to the user.

   Sample outputs are given below.

   2012 is a leap year.
   2000 is a leap year.
   1900 is not a leap year.

[Total 10 Marks]

4. The roots of the quadratic equation $ax^2 + bx + c = 0$, where a, b, & c are real numbers, and $a \neq 0$, are given by the following formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

   In this formula the term b^2-4ac is called the discriminant. If b^2 - 4ac = 0, so the equation has a single repeated root. If b^2 - 4ac > 0, the equation has two real roots. If b^2-4ac < 0, the equation has two complex roots.

   i. Write a void method called *findRoots* to print two roots of the equation.

   [04 Marks]

   ii. Call above method inside the main method while considering given three conditions for the discriminant.

   [06 Marks]

[Total 10 Marks]

5. Write a java program to working with an array of random numbers.

   i. Declare a class called *Rand*.

   [01 Mark]

   ii. Create an array called *randomNumbers* and initialize it with ten random integer values between 0 and 100.

   [05 Marks]

   iii. Display the elements of above array on the screen.

   [02 Marks]

   iv. Define and implement a static method (class method) called *findMax* that takes an integer array as argument and returns the maximum among them.

   [04 Marks]

   v. Define and implement a non-static method called *findMin* that takes an integer array as argument and returns the minimum among them.

   [04 Marks]

   vi. Call above methods (i.e., *findMax* and *findMin*) inside the main method using *randomNumbers* as argument and display the results to the user.

   [04 Marks]

[Total 20 Marks]

6. The Fibonacci series is a series where the next term is the sum of pervious two terms. The first two terms of the Fibonacci sequence are 0 followed by 1.
In mathematical terms, the sequence *F(n)* of Fibonacci numbers is defined by the recurrence relation,

$$F(n) = F(n-1) + F(n-2)$$

with seed values,

$$F(0) = 0 \; and \; F(1) = 1$$

Write a recursive method to find given Fibonacci number. Test this method inside the main method.

[Total 10 Marks]

7. Implement a complete java application by answering following questions.
   i. Declare a class called *Shape*.
   [01 Mark]
   ii. Declare a string variable called color which is common to all shapes.
   [01 Mark]
   iii. Write a constructor that can create an object type of *Shape* by providing color of specific shape.
   [02 Marks]
   iv. Write an abstract method called *perimeter* inside the above class which takes no parameters and returns the perimeter of a specific shape as a double value.
   [02 Marks]
   v. Create a subclass of *Shape* called *Rectangle*.
   [02 Marks]
   vi. Write a constructor that can create an object type of *Rectangle* by providing length and width of specific rectangle.
   [02 Marks]
   vii. Write another constructor that can create a *Squire* as an instance of *Rectangle*.
   [02 Marks]
   viii. Override the method *perimeter* inside the class *Rectangle*.
   [02 Marks]
   ix. Create another subclass of *Shape* called *Circle*.
   [02 Marks]
   x. Write a constructor that can create an object type of *Circle* by providing radius of specific circle.
   [02 Marks]
   xi. Override the method *perimeter* inside the class *Circle*.
   [02 Marks]
   xii. Write a test class for *Shape* called *TestShape*.
   [02 Marks]
   xiii. Create an instance of a *Rectangle* with following dimensions inside the class *TestShape*.
   - length = 4.3
   - width = 2.7

   [02 Marks]

xiv. Create a *Squire* with length of an edge equal to 3.6 as an instance of *Rectangle*.
[02 Marks]

xv. Inside the class *TestShape* create an instance of a *Circle* where radius is 3.5.
[02 Marks]

xvi. Find the perimeter of above three objects using the *perimeter* method you have written and display the results to the user.
[02 Marks]

[Total 30 Marks]

Note:

$Perimeter\ of\ a\ Rectangle = 2 \times (length + height)$

$Perimeter\ of\ a\ Circle = 2 \times \pi \times radius, (\pi = 3.14)$

$Squire\ is\ a\ special\ instance\ of\ a\ Rectangle\ where\ length\ of\ every\ edge\ is\ equal$