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Total Number of Pages: 03

Course: M.Sc.I
Sub_Code: FBEF512

5th Semester Regular Examination: 2024-25

SUBJECT: JAVA Programming

BRANCH(S): M.Sc.I(MC)

Time: 3 Hours

Max Marks: 70

Q.Code : R369

Answer Question No.1 (Part-I) which is compulsory, any five from rest (Part-II)
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- What are syntax errors (compile errors), runtime errors, and logic errors? Suppose you write a program for computing the perimeter of a rectangle and you mistakenly write your program so that it computes the area of a rectangle. What kind of error is this?
- What are literals? Give examples of various literals available in Java.
- Differentiate between switch and multiway-if statements in java.
- Discuss methods to convert string type to numeric types like int, double, float, and short with examples.
- Draw the class hierarchy for Swing.
- What is a thread in Java? Discuss about sleep() and join() method in Thread class.
- What is an inner class and where are they useful?
- What is a sentinel-controlled loop? Explain with an example.
- Differentiate between final, finalize, and finally keywords in java.
- What is an Adapter class in Java?

Part-II

Long Answer Type Questions (Answer Any five)

Q2 a) ISBN-13 is a new standard for indentifying books. It uses 13 digits (5+5)

$d_1d_2d_3d_4d_5d_6d_7d_8d_9d_{10}d_{11}d_{12}d_{13}$. The last digit d_{13} is a checksum, which is calculated from the other digits using the following formula:

$10 - (d_1 + 3d_2 + d_3 + 3d_4 + d_5 + 3d_6 + d_7 + 3d_8 + d_9 + 3d_{10} + d_{11} + 3d_{12})\%10$

If the checksum is **10**, replace it with **0**. Your program should read the input as a string. Here are sample runs:

Enter the first 12 digits of an ISBN-13 as a string: 978013213080

The ISBN-13 number is 9780132130806

- What is a JDBC driver? Why do you need them? What are the different types of JDBC drivers available? Discuss about the steps involved in connecting to a database from a java program.

- Q3 a)** (*The Fan class*) Design and implement a class named **Fan** to represent a fan. The class contains: **(5+5)**
- Three constants named **SLOW**, **MEDIUM**, and **FAST** with the values **1**, **2**, and **3** to denote the fan speed.
 - A private **int** data field named **speed** that specifies the speed of the fan (the default is **SLOW**).
 - A private **boolean** data field named **on** that specifies whether the fan is on (the default is **false**).
 - A private **double** data field named **radius** that specifies the radius of the fan (the default is **5**).
 - A string data field named **color** that specifies the color of the fan (the default is **blue**).
 - The accessor and mutator methods for all four data fields.
 - A no-arg constructor that creates a default fan.
 - A method named **toString()** that returns a string description for the fan. If the fan is on, the method returns the fan speed, color, and radius in one combined string. If the fan is not on, the method returns the fan color and radius along with the string "fan is off" in one combined string.

- b)** What is an array in Java? How do you create array in Java? Can a two-dimensional array in java have different number of elements in each row? Write a method to display the elements of an array to the console.

- Q4 a)** Write a method that returns the intersecting point of two lines. The intersecting point of the two lines can be found by using the formula **(5+5)**
- $$(y_1 - y_2)x - (x_1 - x_2)y = (y_1 - y_2)x_1 - (x_1 - x_2)y_1$$
- $$(y_3 - y_4)x - (x_3 - x_4)y = (y_3 - y_4)x_3 - (x_3 - x_4)y_3$$

The above equations can be solved using Cramer's rule.

Assume that **(x1, y1)** and **(x2, y2)** are the two points on line 1 and **(x3, y3)** and **(x4, y4)** are on line 2.

The method header is

```
public static double[] getIntersectingPoint(double[][] points)
```

The points are stored in a 4-by-2 two-dimensional array **points** with

(points[0][0], points[0][1]) for **(x1, y1)**. The method returns the intersecting point or **null** if the two lines are parallel.

Write a program that prompts

the user to enter four points and displays the intersecting point

- b)** What is a constructor? How you access a super class constructor? What is the call order for constructors? Explain with examples. Do we have constructors in interfaces?

- Q5 a)** (*The **Person**, **Student**, **Employee**, **Faculty**, and **Staff** classes*) Design and implement a class named **Person** and its two subclasses named **Student** and **Employee**. Make **Faculty** and **Staff** subclasses of **Employee**. A person has a name, address, phone number, and email address. A student has a class status (freshman, sophomore, junior, or senior). Define the status as a constant. An employee has an office, salary, and date hired. Use the **Date** class to create an object for date hired. A faculty member has office hours and a rank. A staff member has a title. Override the **toString** method in each class to display the class name and the person's name. Write a test program that creates a **Person**, **Student**, **Employee**, **Faculty**, and **Staff**, and invokes their **toString()** methods. **(5+5)**
- b)** What is the Exception class Hierarchy? What happens when exceptions are not handled? Write a program in java to create **BinaryFormatException**. Use the objects of the newly created exception to throw an exception if the input string is not in binary. Otherwise, the program should display the decimal equivalent of the binary input string.
- Q6 a)** Write a program that prompts the user to enter a hex digit and displays its corresponding binary number. Here is a sample run:
Enter a hex digit: B
The binary value is 1011 **(5+5)**
- b)** What is a package in Java? How package helps in access control with respect to public, private and protected access specifier in Java explain with an example. How to declare a package and import a package in a Java Program?
- Q7 a)** Design and implement an interface named **Colorable** with a **void** method named **howToColor()**. Every class of a colorable object must implement the **Colorable** interface. Design a class named **Square** that extends **GeometricObject** and implements **Colorable**. Implement **howToColor** to display the message **Color all four sides**. **GeometricObject** class has three fields color of type string, filled of type boolean, dateCreated of type java.util.Date **(5+5)**
- b)** What are the criteria to be fulfilled so that a class will be called immutable? Give an example of Java Library class which is immutable. Also write the name of its sister class which is mutable. Describe the role of this keyword.
- Q8 a)** Write a method that returns a new array by eliminating the duplicate values in the array using the following method header:
public static int[] eliminateDuplicates(int[] list)
Write a test program that reads in ten integers, invokes the method, and displays the result. Here is the sample run of the program:
Enter ten numbers: 1 2 3 2 1 6 3 4 5 2
The distinct numbers are: 1 2 3 6 4 5 **(5+5)**
- b)** What is the significance of static keyword in java. Explain with example the use of static variable and function in java.