Semester:	**IV**	**Course Code:**	**22UCSL403**
Course Title:	**Object Oriented Programming Laboratory**	**Division:**	**A & B**
Academic Year:	**2023-24**	**Course Instructors:**	**Prof. IRU, Prof. GN**

List of Practice Programs

1) A vehicle is identified by how many wheels it has. A car, bike and truck are identified by their engine number, chassis number and manufacturer. **Car is-a vehicle, Bike is-a vehicle** and **Truck is-a vehicle**. Using this information, write a Java Program that displays all the information of vehicle, car, bike and truck. Also draw the class diagram for the problem scenario.

2) Using the concept of packages, implement the following scenario:

Create a package named "**basicMath**" inside "**sdmcet.cse.oop**" package. It has a class named **Basic** and provides following methods:

i) Checks if a number is prime or not

ii) Finds sum of digits of a number

Create another package called "**advancedMath**" inside "**sdmcet.cse.oop**" package. It has a class named **Advanced** and provides following methods:

i) Calculates sine, cosine & tan of a degree

ii) Finds the sum of primary diagonal elements of a 3X3 matrix

Create a class named **MathTestDemo** defined inside "**sdmcet.cse.oop**" package. This class has main() method and must invoke all the methods of **Basic** and **Advanced** classes.

3) Write a Java Program that takes a string as command-line argument and checks whether the string is palindrome or not. If the string is palindrome, then print proper message; otherwise, generate a used-defined exception **StringNotPalindromeException**.

4) A chemical company named "XYZ Chemicals Pvt. Ltd." manufactures various chemicals. To automate and monitor the manufacturing process, they are planning to install an "**Automated Manufacturing and Maintenance System**". One important task of this system is to sense the rise in temperature of the furnace and monitor its temperature. If the temperature of the furnace rises above 300 ºC, then it should immediately generate an alarm. It should also generate a separate alarm if the temperature of the furnace falls below

100 ºC. You are hired as a Java Programmer to develop this system. Write a Java Program which simulates the above scenario using exception handling mechanism.

5) Write a Java program that uses threads to compute multiplication of two matrices. The program should perform multiplication of matrices of arbitrary order. Also, proper error handling mechanism should be used.

Methodology: Matrix multiplication is implemented using the formula: $\mathbf{C_{ij} = A_{ik} * B_{kj}}$. This formula is used for generating each element of the final matrix. The multiplication must be performed by separate threads. Ex: If order of final matrix is 3X3, then total of 9 threads should be created; each thread computing individual elements of the final matrix.

6) Write a Java program that creates three threads. The first thread prints prime numbers from 1 to 100; second thread prints prime numbers from 101 to 200 and third thread prints prime numbers from 201 to 300.

Note: The three threads must call the same method **generatePrime()** to print the prime numbers.

7) Write a Java program that simulates client-server interaction using threads.

Methodology: Two threads should be created; one thread should act as server, and the other one should act as client. The server thread should accept a string from the client thread. Upon receiving and displaying the string, the server thread should send back the acknowledgement message "**Message Received**" to the client thread.

8) Write a Java program that provides a generic sort method, which can sort elements of any reference type.

9) Student in SDMCET is identified by USN, first name, last name, branch and division. Write a Java program using generics to provide facility to sort the students based on USN, first name and division. The sort option is to be read by the user.

Note: The program must implement compareTo() method available in Comparable<T> interface to sort the students based on the user's choice

10) Postgraduate course of the CSE department can accommodate a maximum of 20 students. Each PG student in the department is identified by his/her Roll No, USN, Name, Semester and Mobile Number. Using appropriate Collection class, write a Java Program to simulate the following scenarios:

i) On request, the capacity was increased from 20 to 25

ii) Only 3 students enroll for the course

iii) Two students bearing Roll Numbers 2 and 3 voluntarily unroll from the course

iv) After a month, two students get enrolled in the course

v) Print the information of all the students currently enrolled in the course

11) Write a Java program that provides the following implementations:

i) HTML file: displays a text box to read a line of text and provides a submit button

ii) Java Servlet: provides features to handle the request (from HTML file), processes the request and sends the number of vowels and consonants present in the line of text in HTML format

12) Write a Java servlet that implements a simple calculator. The program must provide following implementations:

i) HTML file: displays a form, that reads two numbers from the user and provides the buttons: Add, Subtract, Multiply and Divide

ii) Java Servlet: provides features to handle the request (from HTML file), computes the result and sends back the result in HTML format

13) Write a JSP program that implements a simple calculator. The program must provide the features to perform addition, subtraction, multiplication and division of two numbers based on user's choice.

14) Write a JSP program that reads marks scored by a student in a course (out of 100) and displays the grade obtained.

Use the following table to compute the grades:

Marks (out of 100)	**(90 – 100)**	**(80 – 89)**	**(70 – 79)**	**(60 – 69)**	**(50 – 59)**	**(45 – 49)**	**(40 – 44)**	**(39 – 0)**
Grade	**O**	**A+**	**A**	**B+**	**B**	**C**	**P**	**F**

15) Write a Java program to implement the following scenario:

Consider the following table available in the MySQL instance of **StudentDB**:

StudentInfo	
RollNo	int
Name	varchar(20)
USN	varchar(10)
Division	varchar(1)

Write a Java program that displays contents of the above-mentioned table on the console.

16) Write a Java program that uses connection-oriented sockets and provides multi-way communication between client and server as shown below:

Server: Prompts client to enter a string

Client: <provides a string>

Server: Reverses the string and displays the reversed string and length of the string

17) Write a Java program that uses streams to copy the contents of one file into another. The program must take the file names from command-line arguments and perform error handling if the entered file is invalid or file cannot be opened.

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