CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY (CHARUSAT)
DEVANG PATEL INSTITUTE OF ADVANCE TECHNOLOGY AND RESEARCH
DEPSTAR

Subject : JAVA PROGRAMMING **Semester:** 3

Subject Code: CSE201 **Academic Year :**2024-25

Course Outcome (COs):

At the end of the course, the students will be able to:

CO1	Comprehend Java Virtual Machine architecture and Java Programming Fundamentals.
CO2	Demonstrate basic problem-solving skills: analyzing problems, modelling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters)
CO3	Design applications involving Object Oriented Programming concepts such as inheritance, polymorphism, abstract classes and interfaces.
CO4	Build and test program using exception handling
CO5	Design and build multi-threaded Java Applications.
CO6	Build software using concepts such as files and collection frameworks.

Bloom's Taxonomy:

Level 1- Remembering
Level 2- Understanding
Level 3- Applying
Level 4- Analyzing
Level 5- Evaluating
Level 6- Creating

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Practical List

Sr No.	AIM	Hrs.	CO	Bloom's Taxonomy
PART-I Data Types, Variables, String, Control Statements, Operators, Arrays				
1	Demonstration of installation steps of Java, Introduction to Object Oriented Concepts, comparison of Java with other object-oriented programming languages. Introduction to JDK, JRE, JVM, Javadoc, command line argument. Introduction to Eclipse or NetBeans IDE,or BlueJ and Console Programming.	**2**	**1**	**1**
2	Imagine you are developing a simple banking application where you need to display the current balance of a user account. For simplicity, let's say the current balance is $20. Write a java program to store this balance in a variable and then display it to the user.	**1**	**1**	**2,3,4**
3	Write a program to take the user for a distance (in meters) and the time taken (as three numbers: hours, minutes, seconds), and display the speed, in meters per second, kilometers per hour and miles per hour (hint:1 mile = 1609 meters).	**1**	**1**	**2,3,4**
4	Imagine you are developing a budget tracking application. You need to calculate the total expenses for the month. Users will input their daily expenses, and the program should compute the sum of these expenses. Write a Java program to calculate the sum of elements in an array representing daily expenses. **Supplementary Experiment:** You are creating a library management system. The library has two separate lists of books for fiction and non-fiction. The system should merge these lists into a single list for inventory purposes. Write a Java program to merge two arrays.	**1**	**1, 2**	**2,3**
5	An electric appliance shop assigns code 1 to motor,2 to fan,3 to tube and 4 for wires. All other items have code 5 or more. While selling the goods, a sales tax of 8% to motor,12% to fan,5% to tube light,7.5% to wires and 3% for all other items is charged. A list containing the product code and price in two different arrays. Write a java program using switch statement to prepare the bill.	**1**	**1, 2**	**2**
6	Create a Java program that prompts the user to enter the	**1**	**1, 2**	**2,3,4**

	number of days (n) for which they want to generate their exercise routine. The program should then calculate and display the first n terms of the Fibonacci series, representing the exercise duration for each day. **Supplementary Experiment:** Imagine you are developing a classroom management system. You need to keep track of the grades of students in a class. After collecting the grades, you want to display each student's grade along with a message indicating if they have passed or failed. Let's assume the passing grade is 50.			
	PART-II Strings			
7	Given a string and a non-negative int n, we'll say that the front of the string is the first 3 chars, or whatever is there if the string is less than length 3. Return n copies of the front; front_times('Chocolate', 2) → 'ChoCho' front_times('Chocolate', 3) → 'ChoChoCho' front_times('Abc', 3) → 'AbcAbcAbc'	**1**	**1, 2**	**2,3,4**
8	Given an array of ints, return the number of 9's in the array. array_count9([1, 2, 9]) → 1 array_count9([1, 9, 9]) → 2 array_count9([1, 9, 9, 3, 9]) → 3 **Supplementary Experiment:** 1. Write a Java program to replace each substring of a given string that matches the given regular expression with the given replacement. Sample string : "The quick brown fox jumps over the lazy dog." **In the above string replace all the fox with cat.**	**1**	**1, 2**	**2,3**
9	Given a string, return a string where for every char in the original, there are two chars. double_char('The') → 'TThhee' double_char('AAbb') → 'AAAAbbbb' double_char('Hi-There') → 'HHii--TThheerree'	**1**	**1, 2**	**2**
10	Perform following functionalities of the string: ● Find Length of the String ● Lowercase of the String ● Uppercase of the String ● Reverse String	**1**	**1, 2**	**2,3,4**

	Sort the string			
11	Perform following Functionalities of the string: "CHARUSAT UNIVERSITY" ● Find length ● Replace 'H' by 'FIRST LATTER OF YOUR NAME' ● Convert all character in lowercase **Supplementary Experiment:** 1. Write a Java program to count and print all duplicates in the input string. Sample Output: The given string is: resource The duplicate characters and counts are: e appears 2 times r appears 2 times	**1**	**1, 2**	**4**
PART-III Object Oriented Programming: Classes, Methods, Constructors				
12	Imagine you are developing a currency conversion tool for a travel agency. This tool should be able to convert an amount in Pounds to Rupees. For simplicity, we assume the conversion rate is fixed: 1 Pound = 100 Rupees. The tool should be able to take input both from command-line arguments and interactively from the user.	**1**	**2**	**3**
13	Create a class called Employee that includes three pieces of information as instance variables—a first name (type String), a last name (type String) and a monthly salary (double). Your class should have a constructor that initializes the three instance variables. Provide a set and a get method for each instance variable. If the monthly salary is not positive, set it to 0.0. Write a test application named EmployeeTest that demonstrates class Employee's capabilities. Create two Employee objects and display each object's yearly salary. Then give each Employee a 10% raise and display each Employee's yearly salary again.	**2**	**1, 2**	**3**
14	Create a class called Date that includes three pieces of information as instance variables—a month (type int), a day (type int) and a year (type int). Your class should have a constructor that initializes the three instance variables and assumes that the values provided are correct. Provide a set and a get method for each instance variable. Provide a method displayDate that displays the month, day and year separated by forward slashes (/). Write a test application named DateTest that demonstrates class Date's capabilities.	**2**	**1, 2**	**3**

15	Write a program to print the area of a rectangle by creating a class named 'Area' taking the values of its length and breadth as parameters of its constructor and having a method named 'returnArea' which returns the area of the rectangle. Length and breadth of rectangle are entered through keyboard. **Supplementary Experiment:** 1.Write a Java program to create a class called "Airplane" with a flight number, destination, and departure time attributes, and methods to check flight status and delay. [L:M]	**1**	**1, 2**	**3**
16	Print the sum, difference and product of two complex numbers by creating a class named 'Complex' with separate methods for each operation whose real and imaginary parts are entered by user.	**1**	**1, 2**	**2,3**
PART-IV Inheritance, Interface, Package				
17	Create a class with a method that prints "This is parent class" and its subclass with another method that prints "This is child class". Now, create an object for each of the class and call 1 - method of parent class by object of parent	**1**	**1, 2, 3**	**3**
18	Create a class named 'Member' having the following members: Data members 1 - Name 2 - Age 3 - Phone number 4 - Address 5 – Salary It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherits the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same.	**2**	**1, 2, 3**	**3**
19	Create a class named 'Rectangle' with two data members 'length' and 'breadth' and two methods to print the area and perimeter of the rectangle respectively. Its constructor having parameters for length and breadth is used to initialize length and breadth of the rectangle. Let class 'Square' inherit the 'Rectangle' class with its constructor having a parameter for its side (suppose s) calling the	**1**	**2,3**	**3**

	constructor of its parent class as 'super(s,s)'. Print the area and perimeter of a rectangle and a square. Also use array of objects. **Supplementary Experiment:** 1.Write a Java program to create a vehicle class hierarchy. The base class should be Vehicle, with subclasses Truck, Car and Motorcycle. Each subclass should have properties such as make, model, year, and fuel type. Implement methods for calculating fuel efficiency, distance traveled, and maximum speed. [L:A]			
20	Create a class named 'Shape' with a method to print "This is This is shape". Then create two other classes named 'Rectangle', 'Circle' inheriting the Shape class, both having a method to print "This is rectangular shape" and "This is circular shape" respectively. Create a subclass 'Square' of 'Rectangle' having a method to print "Square is a rectangle". Now call the method of 'Shape' and 'Rectangle' class by the object of 'Square' class.	**2**	**2,3**	**3**
21	Create a class 'Degree' having a method 'getDegree' that prints "I got a degree". It has two subclasses namely 'Undergraduate' and 'Postgraduate' each having a method with the same name that prints "I am an Undergraduate" and "I am a Postgraduate" respectively. Call the method by creating an object of each of the three classes.	**1**	**2,3**	**3**
22	Write a java that implements an interface AdvancedArithmetic which contains amethod signature int divisor_sum(int n). You need to write a class calledMyCalculator which implements the interface. divisorSum function just takes an integer as input and return the sum of all its divisors. For example, divisors of 6 are 1, 2, 3 and 6, so divisor_sum should return 12. The value of n will be at most 1000. **Supplementary Experiment:** 1.Write a Java programming to create a banking system with three classes - Bank, Account, SavingsAccount, and CurrentAccount. The bank should have a list of accounts and methods for adding them. Accounts should be an interface with methods to deposit, withdraw,	**2**	**2,3**	**2,3**

	calculate interest, and view balances. SavingsAccount and CurrentAccount should implement the Account interface and have their own unique methods. [L:A]			
23	Assume you want to capture shapes, which can be either circles (with a radiusand a color) or rectangles (with a length, width, and color). You also want to be able to create signs (to post in the campus center, for example), each of which has a shape (for the background of the sign) and the text (a String) to put on the sign. Create classes and interfaces for circles, rectangles, shapes, and signs. Write a program that illustrates the significance of interface default method.	**2**	**2,3**	**6**
	PART-V Exception Handling			
24	Write a java program which takes two integers x & y as input, you have to compute x/y. If x and y are not integers or if y is zero, exception will occur and you have to report it.	**1**	**4**	**3**
25	Write a Java program that throws an exception and catch it using a try-catch block.	**1**	**4**	**3**
26	Write a java program to generate user defined exception using "throw" and "throws" keyword. Also Write a java that differentiates checked and unchecked exceptions. (Mention at least two checked and two unchecked exceptions in program). **Supplementary Experiment:** 1.Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates. [L:M]	**2**	**4**	**2,3**
	PART-VI File Handling & Streams			
27	Write a program that will count the number of lines in each file that is specified on the command line. Assume that the files are text files. Note that multiple files can be specified, as in "java Line Counts file1.txt file2.txt file3.txt". Write each file name, along with the number of lines in that file, to standard output. If an error occurs while trying to read from one of the files, you should print an error message for that file, but you should still process all the remaining files.	**1**	**4,6**	**3**
28	Write an example that counts the number of times a	**1**	**4,6**	**3**

	particular character, such as e, appears in a file. The character can be specified at the command line. You can use xanadu.txt as the input file.			
29	Write a Java Program to Search for a given word in a File. Also show use of Wrapper Class with an example.	**2**	**4,6**	**3**
30	Write a program to copy data from one file to another file. If the destination file does not exist, it is created automatically. **Supplementary Experiment:** 1.Write a Java program to sort a list of strings in alphabetical order, ascending and descending using streams.	**2**	**4,6**	**3**
31	Write a program to show use of character and byte stream. Also show use of BufferedReader/BufferedWriter to read console input and write them into a file.	**2**	**4,6**	**2,3**
PART-VII Multithreading				
32	Write a program to create thread which display "Hello World" message. A. by extending Thread class B. by using Runnable interface.	**1**	**5,6**	**3**
33	Write a program which takes N and number of threads as an argument. Program should distribute the task of summation of N numbers amongst number of threads and final result to be displayed on the console.	**1**	**5,6**	**3**
34	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	**2**	**5,6**	**3**
35	Write a program to increment the value of one variable by one and display it after one second using thread using sleep() method.	**2**	**5,6**	**2,3**
36	Write a program to create three threads 'FIRST', 'SECOND', 'THIRD'. Set the priority of the 'FIRST' thread to 3, the 'SECOND' thread to 5(default) and the 'THIRD' thread to 7.	**2**	**5,6**	**2,3**
37	Write a program to solve producer-consumer problem using thread synchronization.	**2**	**5,6**	**3**
PART-VIII Collection Framework and Generic				
38	Design a Custom Stack using ArrayList class, which	**2**	**5**	**3**

	implements following functionalities of stack. My Stack -list ArrayList<Object>: A list to store elements. +isEmpty: boolean: Returns true if this stack is empty. +getSize(): int: Returns number of elements in this stack. +peek(): Object: Returns top element in this stack without removing it. +pop(): Object: Returns and Removes the top elements in this stack. +push(o: object): Adds new element to the top of this stack.			
39	Imagine you are developing an e-commerce application. The platform needs to sort lists of products based on different criteria, such as price, rating, or name. Each product object implements the Comparable interface to define the natural ordering. To ensure flexibility and reusability, you need a generic method that can sort any array of Comparable objects. Create a generic method in Java that sorts an array of Comparable objects. This method should be versatile enough to sort arrays of different types of objects (such as products, customers, or orders) as long as they implement the Comparable interface.	**2**	**5**	**6**
40	Write a program that counts the occurrences of words in a text and displays the words and their occurrences in alphabetical order of the words. Using Map and Set Classes.	**2**	**5**	**3**
41	Write a code which counts the number of the keywords in a Java source file. Store all the keywords in a HashSet and use the contains () method to test if a word is in the keyword set.	**2**	**5**	**2,3**