 

# CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEVANG PATEL INSTITUTE OF ADVANCE TECHNOLOGY AND RESEARCH

**DEPARTMENT OF INFORMATION TECHNOLOGY**

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| **Subject :** JAVA PROGRAMMING | **Semester:** 3 |
| **Subject Code:** IT267 | **Academic Year :**2024-25(ODD) |

**Course Outcome (COs):**

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

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| CO1 | Understand and implement Object Oriented programming concept using basic syntaxes of  control Structures, strings and function for developing skills of logic building activity and garbage collection for saving resources |
| 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, abstract classes,  interfaces, inheritance and polymorphism). |
| CO3 | Use and develop Concurrency theory: progress guarantees, deadlock, live lock, starvation,  linearizability. |
| CO4 | Build and test program using new IO api and exception handling |
| CO5 | Analyze and apply collection framework and generics to solve different data structure  algorithms. |
| CO6 | Understand and apply java new features |

# Practical List

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| **Sr. No.** | **AIM** | **DATE** | **SIGN** |
| **PART-I Data Types, Variables, String, Control Statements, Operators, Arrays** | | | |
| **1** | In a peaceful town, a budding programmer named Sam was tasked by her mentor, Ms. Java, to declare an integer variable named age, assign it the value of 25, and display it in a sentence. Sam quickly took to her computer and, with focus, wrote a program that would show "25 is the age of Sam." on the screen. Pleased with her work, Sam proudly presented her solution to Ms. Java, who commended her for her precise and  clear coding skills. |  |  |

 

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| **2** | Java program that converts a string entered by the user to Morse code or vice versa. It will require the implementation of data structures, including arrays, loops, and conditional statements.   * Create two arrays - one to contain the strings of letters to be converted, and one to contain the Morse codes. * In the program's main method, prompt the user for input to choose between the string or Morse. * For Morse code conversion, read in a string from the user; use conditional statements, looping, and array methods to convert the string to Morse-code. * For string conversion, read in a Morse-coded string from the user; use arrays, conditional statements, and looping to convert   Morse code to a string |  |  |
| **3** | A typical mobile number in India is “+91-AA-BBB-CCCCC”. Where the first two digits (AA)indicate a mobile system operator, the next three (BBB) denote the mobile switching code(MSC) while the remaining five digits (CCCCC) are unique to the subscriber. Write an application that takes a mobile number as an input from a user in above mentioned format and display code for mobile system operator, mobile switching code and last 5 digits which are unique to subscriber. Ex. For an input +91-94-999-65789, output should be :Mobile  system operator code is 94 MSC is 999 Unique code is 65789 |  |  |
| **4** | 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. |  |  |
| **5** | Create a Java program that simulates a guessing game, where the computer picks a random number between 1 and 100 and the user has to guess it. We can use the Scanner class to 1 get user input and a loop to allow multiple guesses.   * Prompt the user to guess the number and keep track of the number of attempts they make. * Use if-else statements to give feedback like too low or too high compared to the number. * Use a loop to allow the user to guess again until they guess the correct number |  |  |
| **PART-II String** | | | |
| **6** | Imagine you're tasked with creating a function that takes a string and a number. The goal is to repeat the first few characters of the string a specified number of times. If the string is shorter than the specified length, you should  repeat whatever characters are available. How would you approach this problem?(function) |  |  |

 

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| **7** | Imagine you're working with an array of integers, and your task is to count how many times the number 9 appears in the array. How would you write a Java program that efficiently determines this count, regardless of the array's size or the position of the numbers?  **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. [L:M] |  |  |
| **8** | Suppose you are developing a text transformation tool. Your task is to create a function that takes a string and transforms it such that every character in the original string is doubled. For example, "The" becomes "TThhee". How would you design and implement this function in Java to handle any input string  effectively? |  |  |
| **9** | you're a cybersecurity analyst investigating a suspicious string of characters. You need to analyze it thoroughly to uncover any hidden patterns or anomalies. The number of characters in the string to understand its size, Standardize the string for case-insensitive comparisons, Highlight potential keywords or acronyms, and Identify palindromes or potential encryption methods.  Sort the string: Analyze character distribution and frequency. |  |  |
| **10** | You're tasked with creating a basic encryption algorithm for your college project. The first step involves manipulating a given string, "CHARUSAT UNIVERSITY".  Calculate the number of characters in the string to understand its structure, Identify the target character: The character to be replaced is 'H'. Replace the target character: Substitute 'H' with the first letter of your name. For instance, if your name starts with 'A', replace 'H' with 'A'. and Transform all characters to lowercase for consistency, and display the modified string. |  |  |
| **PART-III Object Oriented Programming: Classes, Methods, Constructors** | | | |
| **11** | You're a budding Java programmer working on a currency conversion application. Your initial task is to convert Pounds to Rupees. To practice different input methods, you decide to implement two approaches: command-line  arguments and user input using the Scanner class. |  |  |

 

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| **12** | 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. |  |  |
| **13** | 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. |  |  |
| **14** | 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] |  |  |
| **15** | Imagine you're building a scientific calculator application. One crucial feature is handling complex numbers. You decide to create a Complex class to represent complex numbers and perform operations on  them.(sum, difference and product) |  |  |
| **PART-IV Inheritance, Interface, Package** | | | |
| **16** | 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 |  |  |

 

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|  | class 2 - method of child class by object of child class 3 - method of parent class by object of child class |  |  |
| **17** | 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. |  |  |
| **18** | 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 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] |  |  |
| **19** | 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. |  |  |
| **20** | Create a class 'Degree' having a method 'getDegree' that |  |  |

 

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|  | 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. |  |  |
| **21** | 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, calculate interest, and view balances. SavingsAccount and CurrentAccount should implement the Account interface and have their own  unique methods. [L:A] |  |  |
| **22** | 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. |  |  |
| **PART-V Exception Handling** | | | |
| **23** | 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. |  |  |
| **24** | Write a Java program that throws an exception and  catch it using a try-catch block. |  |  |
| **25** | Write a java program to generate user defined exception |  |  |

 

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|  | using “throw” and “throws” keyword.  Also Write a java that differentiates checked and unchecked exceptions. (Mention at least two checked and two unchecked exception 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] |  |  |
| **PART-VI File Handling & Streams** | | | |
| **26** | 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. |  |  |
| **27** | Write an example that counts the number of times a 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. |  |  |
| **28** | Write a Java Program to Search for a given word in a  File. Also show use of Wrapper Class with an example. |  |  |
| **29** | 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. [L:A] |  |  |
| **30** | 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. |  |  |
| **PART-VII Multithreading** | | | |
| **31** | Write a program to create thread which display “Hello World” message. A. by extending Thread class B. by  using Runnable interface. |  |  |
| **32** | Write a program which takes N and number of threads |  |  |

 

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|  | 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. |  |  |
| **33** | 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. |  |  |
| **34** | Write a program to increment the value of one variable by one and display it after one second using thread using  sleep() method. |  |  |
| **35** | 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. |  |  |
| **36** | Write a program to solve producer-consumer problem  using thread synchronization. |  |  |