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| **Sr.No.** | **Name of Practical** | **Hour(s)** | **Max. Marks** | **CLO** | **Week** |
| **0** | Setting up Java Programming Environment and exploration of programming paradigms. | 02 | -- | -- | 1 |
| **0** | Hands-on practice on C- Programming | 02 | -- | -- | 1 |
|  | **Take all inputs (wherever required) from user after practical no. 1 onwards** | | | | |
| **1** | 1. Write a Java program to display greeting message like: “Hello! Java” on console. 2. Write a Java program to display all primitive type variables. Also display your name in the last line. 3. Justify the following statement in the context of Java. “ boolean can be true (Non-zero) or false(Zero)”. | 02 | 10 | 1,2 | 2 |
| **2** | 1. Write a Java program to print the ASCII values for characters entered by the user.   ASCII value of A = 65 ASCII value of B = 66…………and So on. Print all the ASCII values on screen.  **Hint:** First 32 characters are non-printing, where 32 itself is an ASCII code for space. Hence cover the characters from 32 and onwards.   1. Write a Java program to get particulars of his/her birthday and display it as shown below. Use 3 variables to hold date, month and year.   Your birthday is 24/07/1989 | 04 | 10 | 1,2 | 2,3 |
| **3** | 1. Write a Java program using class that prints the numbers 1 to 50. For all multiples of 3 print “Fizz” and for all multiples of 5 print “Bizz”. For multiples of both 3 and 5 print “Fizz-Bizz”. 2. Demonstrate concept of Arithmetic & Bitwise Operators with a java program. Operands to be considered as per the operators entered by the user. 3. Write a java program which generates student grade report in console. Take student roll number and marks (out of 100) of 5 courses from user. Calculate the percentage and display grade of the student. Use appropriate control statements. 4. Write a program to calculate area and perimeter of a circle. Take the value of radius from user. | 04 | 10 | 1,2 | 3,4 |
| **4** | 1. Write a Java program to decide the following information based on Body Mass Index. Let the user enter height in feet and inch and weight in pounds (lb). (Hint: 1 feet = 12 inches). Based on BMI computed, print relevant message i.e if BMI is <18.5 print "Person is Under-weight", if BMI is >18.5 & < 24.9 print "Person is having Normal  BMI" & if BMI is >25 & <29.9 print "Person is Over-weight", if BMI>30 print "Person Is Obese". 2. Write a Java program to find all even numbers between1 and a given number given as input by user. 3. Write a Java program to:   **i.** check whether a number is odd or even (using if – else statement)  **ii.** check the category of a given character. (using if…else…if ladder)  **iii.** check whether a number is prime or not. (using for loop)  **iv.** display reverse of a number and check whether it is palindrome or not. (using while/do while loop)  **v.** perform arithmetic operations of a calculator. (using switch case)  **vi.** pattern printing. (using nested loops)  1  1 2  1 2 3  1 2 3 4  1 2 3 4 5  1 2 3 4 5 6 | 04 | 10 | 1,2 | 4,5 |
| **5** | Write a Java program to  **(a)** that allows you to create an integer array of 18 elements with the following values: int A[ ] = {3, 2, 4, 5, 6, 4, 5, 7, 3, 2, 3, 4, 7, 1, 2, 0, 0, 0}. The program computes the sum of element 0 to 14 and stores it at element 15, computes the average and stores it at element 16 and identifies the smallest value from the array and stores it at element 17.  **(b)** sort given n numbers and display them in ascending and descending order.  **(c)** to add two given matrices and to multiply two given matrices. | 02 | 10 | 1,2 | 5 |
| **6** | **(a)** Define a class Rectangle with its length and breadth.  Provide appropriate constructor(s), which gives facility of constructing rectangle object with default values of length and breadth as 0 or passing value of length and breadth externally to constructor.  Provide appropriate accessor & mutator methods to Rectangle class.  Provide methods to calculate area & to display all information of Rectangle.  Design different class TestRectangle class in separate source file, which will contain main function. From this main function, create 5 Rectangle objects by taking all necessary information from the user.  The class has attributes length and width, each of which defaults to 1. It should have member functions that calculate the perimeter and area of the rectangle. It should have set and get functions for both length and width. The set functions should verify that length and width are each floating-point numbers larger than 0.0 and less than 20.0.  **(b)**  Create a class Term. This class represents a term of a polynomial such as 2x4 where 2 is coefficient and 4 is exponent of the term.  Data members:-   * int coefficient * int exponent   Create another class Polynomial. The internal representation of a polynomial is an array of Terms. The size of this array should be fixed.  Provide a constructor for this class that will set all terms of a polynomial object as zero (where coefficient is 0 and exponent is 0). Provide following functions:   * setTerm(int, int) – Setting a term of a polynomial object. Each successive call of this function should set next term of the polynomial object.   It should do the following validations:-   * Whether the exponent of the term being set is already used. * Whether the array size limit is exceeded. * Whether the exponent is negative.   In all the cases it should not set the term and display an appropriate message.   * sort() – to arrange the terms in ascending order of exponents. * provide a function to print a polynomial object   **(c)** Create a class called complex for performing arithmetic operations with complex numbers. Use floating point variables to represent the private data of the class. Provide a default constructor that initializes the object with some default values. Provide public member functions for each of the following  • Addition of two complex numbers: It returns the result obtained by adding the respective real parts and the imaginary parts of the two complex numbers.  • Subtraction of two complex numbers: It returns the result obtained by subtracting the respective real parts and the imaginary parts of the two complex numbers.  • display( ) – It displays the complex number in a+bi format.  The output should be displayed as follows:-  Sum of a1+b1 i & a2+b2 i is : a3+b3 i  **(d)**  Create an object called GSSArray. (It stands for growable self-sorting array)  This object will manage an array of type int. Create a private variable for an array of type int. In the constructor for this object, take in an int value which will determine the starting size of the array. The constructor should also instantiate the array.  Create a public method called insert, which will take in an int and find the location in the array where it belongs and insert it there. If the array is full, then before inserting the value, method insert should call private method increaseSize, which will create a new array which is double the size of the current array. Then it will copy the values from the original array into the new array and set the private variable to this new array.  The array should keep track of how many of its indexes are filled. Create a private variable called lastindex which will be equal to the last index of the array that has a value.  Create a public method delete, which will take an int and it will remove the 1st instance of that number in the array. If the number doesn't exist, the method should return false, otherwise it should return true. (Don't forget to update variable lastindex in methods delete and insert.) | 08 | 10 | 1,2 | 6,7 |
| **7** | **(a)** Write a program to perform following operations on string “Nirma University”   * Reverse the string * Replace character Ni with Ab * Check whether strings “rma” and “Uni” present in original string or not * Compare this program implementation using String and StringBuffer methods.   **(b)**  Write a program to find number of vowels, consonants and digits from an entered string using switch case.  **(c)**  Write a program to reverse words in a string.  For example, if input is “Welcome to Nirma”. Output should be “emocleW ot amriN”.  **(d)** Accept a paragraph of text consisting of sentences that are terminated by either ‘.’ (full stop), ‘!’ (exclamation mark) or a ‘?’ (question mark). Assume that there can be maximum 10 sentences in a paragraph. Write a program to arrange the sentences in increasing order of their number of words.  For Example :  INPUT: Please come and attend the party. Hello! How are you?  OUTPUT :  Hello = 1  How are you = 3  Please come and attend the party = 6 | 06 | 10 | 1,2 | 7,8 |
| **8** | **(a)** Create an abstract class Instrument which is having the abstract function play.  Create three more sub classes from Instrument which is Piano, Flute and Guitar.  Override the play method inside all three classes printing a message.  “Piano is playing tan tan tan tan” for Piano class  “Flute is playing toot toot toot toot” for Flute class  “Guitar is playing tin tin tin” for Guitar class  You must not allow the user to declare an object of Instrument class.  Create an array of 10 Instruments.  Assign different type of instrument to Instrument reference.  Check for the polymorphic behavior of play method.  Use the instanceof operator to print that which object stored at which index of instrument array.    **(b)** Create an abstract class Compartment to represent a rail coach. Provide an abstract function notice in this class. Derive FirstClass, Ladies, General and Luggage classes from the compartment class. Override the notice function in each of them to print notice suitable to the type of the compartment.  Create a class TestCompartment. Write main function to do the following:  Declare an array of Compartment pointers of size 10.  Create a compartment of a type as decided by a randomly generated integer in the range 1 to 4.  Check the polymorphic behavior of the notice method.  **(c)** Consider an example of declaring the examination result. Design three classes: Student, Exam, and Result. The Student class has data members such as those representing roll number, name etc. Create the class Exam by inheriting the Student class. The Exam class adds fields representing the marks scored in six subjects. Derive the Result from the Exam class and it has its own fields such as total\_Marks. Write an interactive program to model this relationship.  **(d)** Create a class Medicine to represent a drug manufactured by a pharmaceutical company. Provide a function displayLabel( ) in this class to print Name and address of the company.  Derive Tablet, Syrup and Ointment classes from the Medicine class. Override the displayLabel( ) function in each of these classes to print additional information suitable to the type of medicine. For example, in case of tablets, it could be “store in a cool dry place”, in case of ointments it could be “for external use only” etc.  Create a class TestMedicine. Write main function to do the following:  Declare an array of Medicine references of size 10  Create a medicine object of the type as decided by a randomly generated integer in the range 1 to 3.  Check the polymorphic behavior of the displayLabel( ) method.  **(e)** Create a class Car which contains members speed, noOfGear. The class has a method drive( ) which  is responsible to provide starting speed and noOfGears to a Car. Implement display( ) method which will display all attributes of Car class.  The class SportCar is derived from the class Car which adds new features AirBallonType. When this method is invoked, initial speed and gear status must be displayed on console. Override the display method which display all attribute of the SportCar. Make use of super class display( ) method.  **(f)** A super class Record has been defined to store the names and ranks of 50 students. Define a sub class Rank to find the highest rank along with the name. The details of both classes are given below:  Class name : Record  Data Members / instance variables:   * name[ ] : to store the names of students * rnk[ ] : to store the ranks of students   Member functions:   * Record( ) : constructor to initialize data members * void readvalues( ) : to store names and ranks * void display( ) : displays the names and the corresponding ranks   Class name : Rank  Data Members / instance variables:   * index : integer to store the index of the topmost rank   Member functions   * Rank( ) : constructor to invoke the base class constructor and to initialize index to 0. * void highest( ) : finds the index location of the topmost rank and stores it in index without sorting the array 6 * void display( ) : displays the name and ranks along with the name having the topmost rank.   Specify the class Record giving details of the constructor( ), void readvalues( ), void display( ). Using the concept of inheritance, specify the class Rank giving details of constructor( ), void highest( ) and void display( ). | 08 | 10 | 1,2 | 8,9 |
| **9** | **a)** An interface Polygon containing the members as given below:  float area, float perimeter  void calcArea( ); abstract method to calculate area of a particular polygon given its dimensions  void calcPeri( ); abstract method to calculate perimeter of a particular polygon given its dimensions  void display( ); method to display the area and perimeter of the given polygon.  Create a class Square that implements Polygon and has the following member:  float side  Square(float s); constructor to initialize side of square  Create another class Rectangle that implements Polygon and has the following member:  float length  float breadth  Rectangle(int len, int bre); constructor to initialize length and breadth of a rectangle  Outside the package, create a class that imports the above package an instantiates an object of the Square class and an object of the Rectangle class. Call the above methods on each of the classes to calculate the area and perimeter given the side and the length/breadth of the Square class and the Rectangle class respectively.  **(b)** Create a class called CalcAverage that has the following method:  public double avgFirstN(int N)  This method receives an integer as a parameter and calculates the average of first N natural numbers. If N is not a natural number, throw an exception IllegalArgumentException with an appropriate message.  **(c)** Create a class Number having the following features:  Attributes:  int first number  int second number  result double  stores the result of arithmetic operations performed on a and b  Member functions:   * Number(x, y) : constructor to initialize the values of a and b * add( ) : stores the sum of a and b in result * sub( ) : stores difference of a and b in result * mul( ) : stores product in result * div( ) : stores a divided by b in result   Test to see if b is 0 and throw an appropriate exception since division by zero is undefined.  Display a menu to the user to perform the above four arithmetic operations.  **(d)** Create a class BankAccount having the members as given below:  accNo integer  custName string  accType string (indicates ‘Savings’ or ‘Current’)  balance float  Include the following methods in the BankAccount class:   * void deposit(float amt); * void withdraw(float amt); * float getBalance();   deposit(float amt) method allows you to credit an amount into the current balance. If amount is negative, throw an exception NegativeAmount to block the operation from being performed.  withdraw(float amt) method allows you to debit an amount from the current balance. Please ensure a minimum balance of Rs. 1000/- in the account for savings account and Rs. 5000/- for current account, else throw an exception InsufficientFunds and block the withdrawal operation. Also throw an exception NegativeAmount to block the operation from being performed if the amt parameter passed to this function is negative.  getBalance( ) method returns the current balance. If the current balance is below the minimum required balance, then throw an exception LowBalanceException accordingly.  Have constructor to which you will pass, accno, cust\_name, acctype and initial balance.  And check whether the balance is less than 1000 or not in case of savings account and less than 5000 in case of a current account. If so, then raise a LowBalanceException.  In either case if the balance is negative then raise the NegativeAmount exception accordingly.  **(e)** Create a class with following specifications.  Class Emp  empId int  empName string  designation string  basic double  hra double readOnly  Methods   * printDET( ) * kalculateHRA( ) * printDET( ) methods will show details of the EMP.   calculateHRA( ) method will calculate HRA based on basic.  There will 3 designations supported by the application.  If designation is “Manager” - HRA will be 10% of BASIC  if designation is “Officer” - HRA will be 12% of BASIC  if category is “CLERK” - HRA will be 5% of BASIC  Have constructor to which you will pass, empId, designation, basic and price.  And checks whether the BASIC is less than 500 or not. If it is less than 500 raise a custom Exception as given below  Create LowSalException class with proper user message to handle BASIC less than 500.  **(f)** Create a class USERTRAIL with following specifications.  val1, val2 type int  Method  boolean show( ) will check if val1 and val2 are greater or less than Zero  Have constructor which will val1, val2 and check whether if it is less than 0 then raise a custom Exception (name: Illegal value exception.) | 10 | 10 | 1,2 | 10,11 12 |
| **10** | **(a)** Implement three classes: Storage, Counter and Printer.  The Storage class should store an integer.  The Counter class should create a thread and starts counting from 0 (0, 1, 2, 3…) and stores each value in the Storage class.  The Printer Class should create a thread that keeps reading the value in the Storage class and printing it.  Write a program that creates an instance of the Storage class and set up a Counter and Printer object to operate on it.  Identify that, whether synchronization is required or not in this assignment. If yes, implement it.  **(b)** Modify the above program i.e 10 (a) to ensure that each number is printed exactly once, by adding suitable synchronization.  **(c)** Write a multithreaded program that will accept 4 strings from the command line and search in a particular file for a given string and display the status of each search on the screen. Note that, all threads are operating on the same file.  **(d)** Write a Java application that will accept two filenames (text files) as command line arguments and use two threads to read contents from the two text files. Each of the threads should sleep for a random time after displaying filename with each line.  **(e)** Create thread t1 and t2. Set priority of main thread to 10, t1 to normal priority +2 and t2 to normal priority -2 d)Write a Java application that will accept two filenames (text files) as command line arguments and use two threads to read and display contents from the two text files.  **(f)** Write a stream based program which will accept Roll Number, Name, Age and Address from user. Age and Roll-no should be numeric. Handle with built-in exception. None of the field should be blank. Handle with custom exception. Ask user, whether to write the data in the file. If answer is yes, then data is saved into a file as an object (User can write many records in the file), otherwise terminate the current program. Write another program to display all the records saved into the file | 12 | 10 | 1,2 | 13,14, 15 |
|  | **Total Hours for Practicals 1 to 10** | 60 Hours | | | |
|  | **\* Extra Practicals for Practice (Not to be considered for evaluation purpose)** | | | | |
| **11\*** | Create a package nirma.itnu.shape containing the following classes and interfaces.  An interface Polygon containing the members as given below:  area float  perimeter float  void calcArea( ); abstract method to calculate area of a particular polygon given its dimensions  void calcPeri( ); abstract method to calculate perimeter of a particular polygon given its dimensions  void display( ); method to display the area and perimeter of the given polygon  Create a class Square that implements Polygon and has the following member:  side float  Square(float s); constructor to initialize side of square  Create another class Rectangle that implements Polygon and has the following member:  length float  breadth float  Rectangle(int len, int bre); constructor to initialize length and breadth of a rectangle  Outside the package, create a class that imports the above package an instantiates an object of the Square class and an object of the Rectangle class.  Call the above methods on each of the classes to calculate the area and perimeter given the side and the length/breadth of the Square class and the Rectangle class respectively. | -- | -- | 1,2 | -- |
| **12\*** | **Write a java program to implement the concept of user defined exception for Employee Management System. All the details should be stored in a text file and your program should provide an option to retrieve the data based on user’s request and display it on console window. Menu options should be given to user.**  **Decide where user-defined exception is required.**  **Sample Output:**  Enter employee-1 details:  Enter employee no and name: -5554  Exception caught: enter valid number  Enter employee-1 details:  Enter employee no and name: 3001  Raj Dave  Enter job and salary: Lecturer 25000  Enter employee-2 details:  Enter employee no and name: 3002  Kinjal Dave  Enter job and salary: Asst. Professor 40000  The final output should be stored in a text file and once user selects an option to display the details on console it should retrieve and display content from text file as given below:  **ENO ENAME JOB SALARY**  3001 Raj Dave Lecturer 25000  3002 Kinjal Dave Asst. Professor 40000 | -- | -- | 3 | -- |
| **13\*** | **Implement a java program for scenario as given below:**  Encryption is a technique of coding messages to maintain their secrecy. A String array of size ‘n’ where ‘n’ is greater than 1 and less than 10, stores single sentences (each sentence ends with a full stop) in each row of the array.  Write a java program to accept the size of the array. Display an appropriate message if the size is not satisfying the given condition.  Define a string array of the inputted size and fill it with sentences row-wise.  Change the sentence of the odd rows with an encryption of two characters ahead of the original character.  Also change the sentence of the even rows by storing the sentence in reverse order. Display the encrypted sentences as per the sample data given below. Test your program on the sample data and some random data.  Sample Input and Output:  Input: n=4  IT IS CLOUDY.  IT MAY RAIN.  THE WEATHER IS FINE.  IT IS COOL.  Output:   KV KU ENQWFA.  RAIN MAY IT.  VJG YGCVJGT KU HKPG.  COOL IS IT.  Input: n=13  Output: INVALID ENTRY | -- | -- | 1,2 | -- |
| **14\*** | **Implement a java program for scenario as given below:**  Write a program which takes a string (maximum 80 characters terminated by a full stop. The words in this string are assumed to be separated by one or more blanks.  Arrange the words of the input string in descending order of their lengths. Same length words should be sorted alphabetically. Each word must start with an uppercase letter and the sentence should be terminated by a full stop. **In the end store the final output in a text file.**  Test your program for the following data and some random data.  SAMPLE DATA:        INPUT:        "This is human resource department."         OUTPUT:        Department Resource Human This Is.       INPUT:        "To handle yourself use your head and to handle others use your heart."       OUTPUT:        Yourself Handle Handle Others Heart Head Your Your And Use Use To To. | -- | -- | 1,2 | -- |