NIRMA UNIVERSITY
Institute of Technology
B.Tech. Computer Science and Engineering
Practical List
Semester-III

2CS302	Object Oriented Programming	[2-0-4-4]

Sr. NO	Practical Title	Hours	CLO
1.	**a)** Setting up Java Programming Environment and exploration of programming paradigms. **b)** Hands-on practice on C- Programming: i. Write a program in C to display and count a total number of duplicate elements in an array. Test Data : Input the number of elements to be stored in the array :5 Input 5 elements in the array : element - 0 : 5 element - 1 : 1 element - 2 : 1 element - 3 : 2 element - 4 : 2 Expected Output : Total number of duplicate elements found in the array is : 2 Duplicate elements:1,2 ii. Write a program in C to count the frequency of each element of an array. Test Data : Input the number of elements to be stored in the array :3 Input 3 elements in the array : element - 0 : 25 element - 1 : 12 element - 2 : 43 Expected Output : The frequency of all elements of an array : 25 occurs 1 times 12 occurs 1 times 43 occurs 1 times **c)** Write a Java program to display greeting message like: "First Java Program…." on console. **d)** Write a Java program to display all primitive type variables. Also display your name in the last line. **Extra Practicals:** **e)** Hands-on practice on C- Programming:	06 Hours	1

	i. Write a program in C to convert decimal number to binary number using the function. Use user defined function(s) concept in program. Test Data : Input any decimal number : 65 Expected Output : The Binary value is : 1000001 ii. Write a program in C to check whether two given strings are an anagram. An anagram of a string is another string that contains same characters, only the order of characters can be different. For example, "abcd" and "dabc" are anagram of each other. Test Data : Input the first String : spare Input the second String : pears Expected Output : spare and pears are Anagram		
2.	**a)** Write a Java Program that check whether user entered number is special number or not. For example, Consider the number is 59. First, find the sum of all digits (5+9=14). Second, find multiplication of all digits (5*9=45). Then find addition of sum and multiplication of all digits (14+45=59). If it is same as number itself, than it is a special number. **b)** Write a Java program using class that prints the numbers 1 to N (N must be scan from the user). For all multiples of 3 print "Bizz" and for all multiples of 5 print "Fizz". For multiples of both 3 and 5 print "Bizz-Fizz". **c)** Write a Java program that demonstrate the concepts of automatic and explicit type casting. **d)** 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. 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 **Extra Practicals:** **e)** 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.	06 Hours	1

	f) 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 01/01/2001		
3.	Write a Java program for the following: **a)** Design calculator which contains arithmetic & bitwise operators. Operand(s) and operator must be scan from the user. **b)** Find largest between three numbers using ternary operator. **c)** Given an array of size N-1 such that it only contains distinct integers in the range of 1 to N. Find the missing element. Example: Input: N = 10 A[] = {6,1,2,8,3,4,7,10,5} Output: 9 **d)** Given an array of positive and negative numbers. Find if there is a subarray with 0 sum. Example: Input: 5 4 2 -3 1 6 Output: Yes Explanation: 2, -3, 1 is the subarray with sum 0. **e)** Given an unsorted array arr[] of size N having both negative and positive integers. The task is place all negative element at the end of array without changing the order of positive element and negative element. Example: Input : N = 8 arr[] = {1, -1, 3, 2, -7, -5, 11, 6 } Output : 1 3 2 11 6 -1 -7 -5 **Extra Practicals:** **f)** Demonstrate the clear difference between Boolean Logical Operators and Short-Circuit Logical Operators. **g)** Given an array, rotate the array by one position in clock-wise direction. Example: Input: N = 5 A[] = {1, 2, 3, 4, 5} Output: 5 1 2 3 4 **h)** Given an array of N integers, and an integer K, find the number of pairs of elements in the array whose sum is equal to K. Example1: Input: N = 4, K = 6 arr[] = {1, 5, 7, 1} Output: 2 Explanation: arr[0] + arr[1] = 1 + 5 = 6	06 Hours	1

	and arr[1] + arr[3] = 5 + 1 = 6.		
4.	**a)** Write a Java program by creating an 'Employee' class having the following methods and print the final salary. • 'getInfo()' which takes the salary, number of hours of work per day of employee as parameter • 'AddSal()' which adds $10 to salary of the employee if it is less than $500. • 'AddWork()' which adds $5 to salary of employee if the number of hours of work per day is more than 6 hours. **b)** Write above program using concepts of constructor and parameterized constructor. **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 methods 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. The method must return complex class object. • 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. The method must return complex class object. • 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 **Extra Practicals:** **d)** 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. **e)** 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.	04 Hours	2

	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		
5.	**a)** Write a program to perform following operations on string "Nirma University" 1. Reverse the string 2. Replace character Ni with Ab 3. Check whether strings "rma" and "Uni" present in original string or not 4. Compare this program implementation using String and StringBuffer methods. **b)** Write a Java Program which asks user to enter a paragraph and perform the following operations: 1. Find total no of sentences in the paragraph and the total number of words in each sentence. 2. Find the total number of characters in the entire paragraph and find out the occurrence of each character in the paragraph and display the information in proper format. 3. Search a word (entered by the user) in the paragraph and print the position of the word (if found) or print appropriate message. **c)** 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. **d)** **Extra Practicals:** **e)** Write a program to find number of vowels, consonants and digits from an entered string using switch case. **f)** Write a program to reverse words in a string. For example, if input is "Welcome to Nirma". Output should be "emocleW ot amriN".	04 Hours	2
6.	**a)** Write a complete Java Program as per scenario given below: Create a class Student. The class Student has following members: • String name - which is used to store student name.	06 Hours	2

- String rollno - which is used to store student roll number.
- int mark1 - which is used to store student subject-1 mark.
- int mark2 - which is used to store student subject-2 mark.
- int mark3 - which is used to store student subject-3 mark.
- int total() - finds the total of mark1, mark2 and mark3.

Create a class Percentage which inherits Student class. The class Percentage has following members:

- float percentage - which is used to store student percentage.
- void Getter() - which is used to scan values of variables name, rollno, mark1, mark2 and mark3.
- float percent() - returns the percentage of student. It calls the method total() for percentage calculation.

Create a class Grade which inherits Percentage class. The class Grade has following members:

- void PrintGrade() - prints the grade of subject-1, subject-2 and subject-3.
- For grade calculation refer the following table:

Percentage	**Grade**
90 and above	A+
80 to 89	A
70 to 79	B+
60 to 69	B
50 to 59	C+
40 to 49	C
Less than 40	IF

Create a class Test which has main method. The main method creates the object of Grade class and call various methods to print one student grade details.

b) Create a class BasicPatient. The class BasicPatient has following members:

- String name - which is used to store patient name.
- int age - which is used to store patient age.
- String address - which is used to store patient address.
- void Display() - The use of the method to display name, age and address of patient.

Create a class Patient which inherits BasicPatient class. The class Patient has following members:

- No argument constructor which initializes age to zero and name & address to blank string.
- Parameterize constructor which initialize the class variables as per arguments given.

Create a class CovidParameters which inherits Patient class. The class CovidParameters has following members:

- No argument constructor which initializes CTScore, D-dimer and platelet to zero and also call the parent class constructor.
- Parameterize constructor which initialize the class variables as per arguments given and also call the parent class constructor.
- float CTScore - which is used to store CT scan score of patient.
- float D-dimer - which is used to store D-dimer score of patient.
- int platelet - which is used to store platelet count of patient.

	▪ void Display() - which is used to display CTScore, D-dimer, platelet and call the Display() method of Patient class also. ▪ void Getter() - which is used to scan values of name, age, address, CTScore, D-dimer and platelet of patient. Create a class Test. The class Test has following functionalities: ▪ Create the array of objects for CovidParameters class. The size of the array is entered by the user. ▪ Call Getter() and Display() method for array of objects for CovidParameters class. Also display patients' information in descending order of CTScore. **Extra Practicals:** **c)** 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( ).		
7.	**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. **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.	06 Hours	2

	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. **Extra Practicals:** **c)** Write a program in JAVA to implement an abstract class called Shape which has three subclasses say Triangle, Rectangle, Circle. Define one method area() in the abstract class and override this area() method in three subclasses to calculate for specific object i.e. area() of Triangle subclass should calculate the area of triangle etc. same should be applicable for other subclasses. **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.		
8.	**a)** An interface Polygon containing the members as given below: 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)** Write a complete Java Program as per scenario given below: Create an Interface ArithmeticOp. The interface ArithmeticOp has following members: ■ float addition(float a, float b) - add a and b variables	06 Hours	2

	■ float subtraction(float a, float b) - subtract a and b variables. ■ float divide(float a, float b) - divide a and b variables. ■ float multiplication(float a, float b) - multiply a and b variables. Create an Interface StringOp. The interface StringOp has following members: ■ String merge(String s1, String s2, String s3) – perform merge three strings. ■ String replace(String mainString, String searchWord, String replaceWord) – replace searchWord with replaceWord in mainString all occurrences. ■ String sortWords(String mainString) – sort all the words of mainString in descending order. Create a class Operation which implement ArithmeticOp and StringOp interfaces. The class Operation has following members: ■ float no1 - holds the value of operand 1. ■ float no2 - holds the value of operand 2. ■ float result - holds the value of operation result. ■ String mainString - holds the value of main string. ■ String searchWord - holds the value of search word string. ■ String replaceWord - holds the value of replace word string. ■ String s1, s2, s3 - holds the value of three strings. Create a class OpTest. The class Test has following functionalities: ■ Create the object for Operation class. ■ Create the menu driven program which will call method of Operation class based on an option selected by the user. **Extra Practicals:** **c)** 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.		
9.	**a)** Create a class called MathFunctions. It provides following functionalities : float getMean() float divideNum() getMean() function takes an integer array as input and provides the mean of the array elements as output. The array element should be in the range of 0 to 100. If the number is less than 0 and greater than 100, raise the custom exception 'InvalidNumber'. Write an appropriate custom exception class for the same. divideNum() function takes two integer numbers as input from the user and provides the result of division (number1/number2). If the number2 entered by the user is zero, raise the build in exception for 'Divide by Zero'. Create a main class, which will create an object of MathFunctions and call the appropriate method. The user can perform the mean calculation or Division task, allow the user to enter the appropriate choice of operation he/she wants to perform. Show the concept of handling multiple exceptions through a single try block. Also	08 Hours	3

have generic catch block to handle other exceptions that may occur due to array like (index out of bound, null pointer and so on).

b)

Create a class called BankAccount, it has following data members :

integer accountNumber
String CustomerName
String AccountType ('Savings' or 'Current')
float balance
Member Functions of the class are :
void deposit (float amt);
void withdrad (float amt);
float getBalance();

deposit(float amt) method allows you to credit an amount into the current balance. If the 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.

A constructor to this class will allow you to pass account number, customer name, account type and opening balance. Minimum opening balance for a savings account is 1000 Rs and for current account, it is 5000 Rs. If the amount entered is less than that, raise the LowBalance exception and prompt the user to enter the opening balance again.

Write appropriate custom exception classes.

Extra Practicals:

c)

Create a class called 'Emp' with following specifications :

Data Members :
empId int
empName string
designationstring
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.		
10.	**a)** Write a java program that creates two threads (using Thread class). First thread prints the odd numbers till n and thread two prints the even number till n, where n is taken from the user. The output of both the thread should be in format as given below : OddThread : 1 EvenThread :2 The numbers should be printed in sequential order. Use appropriate synchronization mechanisms if needed. **b)** 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. The output of 1 string search should be first and so on, use the concept of join and isalive function. **c)** Create thread t1 and t2. Set priority of the main thread to 10, t1 to normal priority +2 and t2 to normal priority -2. Write a Java application that will accept two filenames (text files) and use two threads to read and display contents from the two text files. **d)** Consider the sample content of two files shown below : File_1 P1, Product1, 20 P2, Product2, 25 …… File_2 P1, 100 P2, 150 …….. File_3 P1, Product1, 2000 ……..	08 Hours	3

	A company manufacturer has production of multiple products every month. File_1 shows the details of Product (Product ID, Product name, quantity) and File_2 shows the details of Price (Product id, Price). Write a program to read the content of both the files and generate the entire product details (Product ID, Product Name, Total Amount) and store the details in File_3. Total amount is Price * Quantity. Take the name of the file from the user through the command line. Raise an exception if the entered file name is incorrect. **Extra Practicals:** **e)** 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		