NETAJI SUBHASH ENGINEERING COLLEGE
TECHNO CITY, GARIA, KOLKATA- 700152

Subject: **Object Oriented Programming Lab** Code:**PCC-CS593**
Stream: IT/3A Credit: 2

Assignment: - 01/ ***Introduction to JAVA Program and concept of Data Types***

A. Write a java program to print NSEC and Information Technology. Apply \n in your program.
B. Write a java program which will take radius of a Circle as user input and calculate area and perimeter to display the results.
C. Using command line argument write a java program to print Object Oriented Programming Using Java.

Assignment: - 02/ ***Concept of Variables and Operators***

A. Write a java program to swap two variables using and without using third variable.
B. Consider the basic pay of an employee as user input. AGP is 50% of the basic pay. Company provides 50% DA and 15% HRA on the merged basic(Basic+AGP). Write a java program to calculate and display total salary of the employee.

Assignment: - 03/ ***Concept of Operators and Conditional Statement***

A. Write a java program to identify largest among three numbers using Conditional Operator (? :).
B. In general an equation of the form $ax^2 + bx + c = 0$ is known as quadratic equation. Accept the values of a, b, and c from the user and write a java program to calculate the roots of the given quadratic equation.
C. Write a java program to check whether a year is Leap Year.
D. An Electric Power Distribution Company charges its domestic consumers as follows:

Consumption Unit	Rate of Charge
0 – 200	Rs 0.50 per unit
201 – 400	Rs 100 + Rs 0.65 per unit
401 – 600	Rs 200 + Rs 0.80 per unit
Above 600	Rs 300 + Rs 1.00 per unit

Write a java program which will accept number of units from the consumer and display the amount to be paid.

Assignment: - 04/ ***Concept of Loop Structure and Use of break keyword***

A. Write a java program to calculate $y = x^n$, where x and n are user inputs, using loop.
B. Write a java program to generate Fibonacci Series up-to n terms using loop.
C. Write a java program to generate all Prime Numbers within a range, where range is user input.
D. Write a java program to reverse a number and check whether it is a Palindrome.

Assignment: - 05/ ***Loop Structure continued…***

A. Write three separate java programs to generate the following patterns:

```
*                   A                   1
* *                 B C                 1 2
* * *               D E F               1 2 3
* * * *             G H I J             1 2 3 4
* * * * *           K L M N O           1 2 3 4 5
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B. An automorphic number is the number which contained in last digit(s) of its square. Example 25 is an automorphic number as its square is 625 and 25 is present as the last two digits. Print all automorphic numbers within range 11 to 40.

C. A number is said to be a special number, if the sum of the factorial of the digits of a number is same as the original number. Example-145 is a special number, because 1! + 4! + 5! =145. Print all special numbers within range 100 to 999.

Home Assignment

D. A composite magic number is positive integer which is composite as well as magic number. Composite number is a number that has more than two factors (For example 10, factors are 1, 2, 5, 10). A magic number is a number in which eventual sum of the digits is equals to 1(For example 28 = 2+8= 10=1+0=1). Write a java program which accepts two positive integer m and n, where m is less than n. Display the composite magic positive integers that are in range between m and n (both inclusive) and output them along with frequency.
Example- m=10 and n=100
Composite magic integers are 10, 28, 46, 55, 64, 82, 91, 100
Frequency of composite magic integers is 8.

E. A circular prime number is a prime number that remains prime under cyclic shifts of digits. When the leftmost digit is removed and replaced at the end of remaining string of digits, the generated number is still prime. The process is repeated until the original number is reached again. A number is said to be prime if it has only two factors 1 and itself. Write a java program which will accept a positive number N and check whether it is a circular prime or not. The new numbers formed after shifting of digits should also be displayed.
Example- 131 – 311 – 113 [131 is Circular Prime]
197 – 971 – 719 [197 is Circular Prime]
1193 – 1931 – 9311 -3119 [1193 is circular Prime]
29 – 92 [29 is not circular prime]

Assignment: - 06/*Concept of Array*

A. Write a java program to find out the largest and smallest element from a 1D and 2D array.

B. Write a java program to store 6 elements in an array P, and 4 elements in an array Q and produce a third array R, containing all the elements of array P and Q. Display the resultant array.

C. Write a menu driven java program to sort a list on n numbers using the following sorting techniques:
(a)Bubble Sort. (b) Selection sort. (c) Insertion Sort.

D. Write a menu driven java program to search an element from list on n numbers using following searching techniques: (a) Linear Search (b) Binary Search

Home Assignment

E. Write a menu driven java program to implement a stack operation (Push, Pop, and Display) using array.

F. Write a menu driven java program to implement a Linear Queue using array.

G. Write a menu driven java program to implement a Circular Queue using array.

H. Write a java program to declare a square matrix A [ ][ ] of order (M X M) where M must be greater than 3 and less than 10. Allow the user to input positive integers into this matrix. Perform the following task on the matrix.
Sort the non-boundary elements in ascending order using any standard sorting technique and rearrange them in the matrix.
Calculate the sum of both diagonals.
Display the original matrix, rearranged matrix, and only the diagonal elements of rearranged matrix with their sum.

INPUT M=4	OUTPUT Original Matrix	OUTPUT Rearranged Matrix	OUTPUT Rearranged Matrix
9 2 1 5 8 13 8 4 15 6 3 11 7 12 23 8	9 2 1 5 8 13 8 4 15 6 3 11 7 12 23 8	9 2 1 5 8 3 6 4 15 8 13 11 7 12 23 8	9 5 3 6 8 13 7 8 Sum of diagonal=59

Assignment: - 07/*Concept of Class, Object, Methods, Recursion & Array of Objects*

A. Create a class Room which will store width, height and breadth of the room in three variables. Create another class Roomdemo which will use earlier class, create instances of rooms, set the values of variables and would calculate volume of the rooms.

B. Write a java program to solve the Tower of Hanoi problem for n disks (n should be taken as keyboard input) using recursion.

C. Write a java program to display the Fibonacci sequence for n terms using recursion.

Home Assignment

D. Declare a class student that represents the following hierarchical information- id, name (First, Middle, Last), Gender, DOB (day, month, year), marks of 3 subjects (English, Mathematics, Computer Science). Write a java program to store and display the database of n students by using array of objects. Also write methods to search a particular student (based on id or name) from array and display his/her details.

Assignment: - 08/*Concept of Inheritance, method overloading & method Overriding*

A. Write a java program to overload a function rect()
void rect (int, char)- With one integer argument and one-character argument draw a filled square of side n using character stored in ch.
void rect(int, int, char) – With two integer argument and one character argument draw a filled rectangle of length l and width b using characters stored in ch.

B. Create a class called Employee which maintains the details of an employee (EID, Name, Basic, City). The class contain the following member function
i) Takes all the details of Employee.
ii) Shows the details of an employee
iii) Find the gross salary of an employee.
Create two subclasses Company1 and Company2 which inherits the parent class Employee but the salary structure is different than the Employee class. Override the function Salary() according to the company1's and company2's salary structure. Considering salary structure of Company1, AGP is 40% of the basic pay. Company provides 25% DA and 10% HRA on the merged basic (Basic+ AGP). Similarly, Company2 provides AGP 50% of the basic pay. They also provide 50% DA and 15% HRA on the merged basic (Basic+ AGP). Create a main class to instantiate several objects of these classes and implement the above stated function.

C. Create a generic base class called "Vehicle "that stores number of wheels and speed. Create the following derived classes Car that inherits vehicle and also stores number of passengers.
Truck that inherits vehicle and also stores the load limit.
Write a main () function to create objects of these classes and display all the information about Car and Truck also compare the speed of two vehicles Car and Truck and display "faster" or "slower". if car is faster or slower than Truck.

D. Write a program that creates a base class called "Number". This class holds an integer value and contains an abstract method called displayNum(). Create two derived classes called "HexNum" and "OctalNum" that inherit "Number". Override displayNum() in the derived classes so that it displays the value in Hexadecimal and Octal respectively. Write a main() function to create objects of type "HexNum" and "OctalNum" classes and display the hexadecimal and octal form of supplied integer value. (Use base class Object to call a function).

E. Write a program that creates a base class called "Distance". It stores the distance between two points in a double value variable and contain an abstract method called travelTime() that outputs the time it takes to travel that distance, assuming that the distance is in miles and speed is 60 miles per hour. In derived class called "DistMKS", override travelTime() assuming that distance is in Kilometers and speed is 100 kilometers per hour(Use base class Object to call a function).

F. Create an abstract base class called called "2Dfigure" that holds two dimensions of a figure. It also declares an abstract function called calculateArea() that when overridden by derived classes returns the area of type 2Dfigure defined by the derived class. Create two derived classes "Rectangle" and "Triangle" that inherit "2Dfigure". Write a main() function to create object of these classes and display the area of rectangle and triangle.(Use base class Object to call a function).

G. Develop an abstract class "GeometricObject" which will have two member variables color and weight. It would have constructor function for setting the color as "White" and weight as "1.0" as default values. The class should have methods getColor() and getWeight() to return the color and weight values to the caller. The class should have two abstract methods findArea() and findCircumference(). Write a subclass for "GeometricObject" called "Triangle" which will able to calculate area and circumference for a triangle.

Assignment: - 9/*Concept of Exception Handling*

A. Write a code segment in Try block where divide by zero occurs, also write corresponding catch block to catch the exception that occurs in the try block. Print the origin of the exception caught.

B. Create an array of 10 integers and assign an integer in location 15 of the array. Print the appropriate message in catch block. Considering the same assignment write two catch block one to catch the "Exception" another for exception "ArrayIndexOutofBoundsException". In first catch block re-throw the exception caught. In second catch block print the origin of the exception.

C. Write a java code segments that results a "NullPointerException". Write a necessary catch block to handle the exception. Also write a finally block with appropriate statements in it.

D. Create a superclass Mathexception and two subclasses Overflowexception and UnderflowException. Write a code segment that throws an Overflowexception. Write three catch block one for Mathexception and others are for Overflowexception and UnderflowException. In first catch block re-throw the exception caught in other two catch blocks, write appropriate message to handle it and show the results. Instantiate an integer variable and initialize with some value. If the value is greater than 100 an OverFlowException is thrown otherwise an UnderFlowException is thrown, handle the exception with appropriate message.

Assignment: - 10/*Concept of Thread*

A. Create two threads. One will print from 1 to 10. Another will print 10 to 1. In the second thread if value is 6 it will sleep for 10000 milliseconds.

B. Create a class with 2 instance variables say integer a & integer b. Create a method add that will copy value of instance variables into some local variables c & d. Then the method will sleep for 0.5 seconds, add their values (a & b) and print it. Create another method increase that will increase the value of a & b by 5 each, wait for 0.5 seconds and print their values. Create two different threads to perform this 2 tasks, invoke the add thread first.

Assignment: - 11/*Concept of Package*

A. Create your own package having an interface called addmul with two methods add( ) and show ( ). Create three different implementations of that interface to add either 2 integers, or 2 double or 2 strings. Create your own method outside the package.

Assignment: - 12/*Concept of Applet*

A. Create an applet to draw a smiling face.
B. Create another applet to draw a house whose door will open and close at 1 second interval.

Home Assignment

C. Create an applet to draw a rectangle that can be resized by mouse dragging. Create an applet that will take two double values through text boxes and perform mathematical operation according to the button pressed.
D. Create an applet that will print your name, the font should be resized by pressing enlarge or contract button.
E. Create an applet to edit a text file.
F. Create an applet with buttons home, cup, Indian flag. It should draw a picture in a different frame whenever you press a button.

1.

2.

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