MCKV Institute of Engineering

243 G. T. Road (N), Liluah, Howrah – 711204

Subject: **Object Oriented Programming Lab** Code:**PC-CS592**
Stream: CSE Credit: 1.5

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

A. Write a java program to print MCKVIE and Computer Science & Engineering. 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 a 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 using conditional operator.

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.
E. Write a program to check a given number is a magic number or not. A number is said to be a Magic number if the sum of its digits are calculated till a single digit is obtained by recursively adding the sum of its digits. If the single digit comes to be 1 then the number is a magic number. Example- 199 is a magic number as 1+9+9=19 but 19 is not a single digit number so 1+9=10 and then 1+0=1 which is a single digit number and also 1. Hence it is a magic number. Print all the magic numbers within a given range.

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

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

```
*
* *
* * *
* * * *
* * * * *
```

```
A
B C
D E F
G H I J
K L M N O
```

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

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]

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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 sorted (ascending order) elements in an array P, and 4 sorted (ascending order) elements in an array Q and produce a third array R (without any sorting technique) , containing all the elements of array P and Q in sorted order. 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 (Non recursive)

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	9	2	1	5	9	2	1	5	9 5
8	13	8	4	8	13	8	4	8	3	6	4	3 6
15	6	3	11	15	6	3	11	15	8	13	11	8 13
7	12	23	8	7	12	23	8	7	12	23	8	7 8
												Sum of diagonal=59

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Assignment: - 07/*Concept of Class, Object, Method Overloading, 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. Create a separate class to define the non-static recursive function TOH(int, char, char, char).

C. Write a java program to display the first n Non-Fibonacci terms using recursion. Create a separate class to define the non-static recursive function Fibo(int n).

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 considering an 1D array (English, Mathematics, Computer Science). To store the name and DOB use the concept aggregation. 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.

E. 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.

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Subject: **Object Oriented Programming Lab** Code:**PC-CS592**
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Assignment: - 08/ String Handling

A. Write a program to accept a sentence.
Perform the following tasks:
(i) Convert the first letter of each word to uppercase and print the sentence.
(ii) Find the number of vowels and consonants in each word and display them with proper headings along with the words.
Test your program with the following inputs.
Example
Input: God is great.
Output: God Is Great

Word	Vowels	Consonants
God	1	2
Is	1	1
Great	2	3

B. Write a program that accepts a comma-separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
Input Format: The first line of input contains words separated by the comma.
Output Format: Print the sorted words separated by the comma.
Example:
Input: without,hello,bag,world
Output: bag,hello,without,world

C. Assuming that we have some email addresses in the "username@companyname.com" format, please write program to print the company name of a given email address. Both user names and company names are composed of letters only.
Input Format: The first line of the input contains an email address.
Output Format: Print the company name in single line.
Example;
Input: john@google.com
Output: google

D. The encryption of alphabets are to be done as follows:
A=1
B=2
C=3
. . .
Z = 26
The potential of a word is found by adding the encrypted value of the alphabets.
Example: KITE
Potential = 11 + 9 + 20 + 5 = 45
Accept a sentence. Each word of sentence is separated by single space. Decode the words according to their

potential and arrange them in ascending order. Output the result in the format given below:
Example 1

> ***Input*** : THE SKY IS THE LIMIT.
> ***POTENTIAL*** :
> THE = 33
> SKY = 55
> IS = 28
> THE = 33
> LIMIT = 63
> OUTPUT : IS THE THE SKY LIMIT

E. You want to know the ASCII value of all the names of your friends. Write a program in java to store n number of names (n is the user input) in a single-dimensional array. Now create another array, which stores ASCII values of the corresponding names. Finally, display the name having the highest ASCII value among the names.

F. Write a program to input a word from the user and remove the consecutive repeated characters by replacing the sequence of repeated characters by its single occurrence.
Example:
Input –Jaaavvvvvvvvaaaaaaaaaa
Output – Java

G. A string with parentheses is well bracketed if all parentheses are matched: every opening bracket has a matching closing bracket and vice versa. Write a java function wellbracketed(s) that takes a string s containing parentheses and returns True if s is well bracketed and False otherwise.
Hint: Keep track of the nesting depth of brackets. Initially the depth is 0. The depth increases with each opening bracket and decreases with each closing bracket. What are the constraints on the value of the nesting depth for the string to be wellbracketed?
Here are some examples to show how your function should work.
>>> wellbracketed("22)") False
>>> wellbracketed("(a+b)(a-b)") True
>>> wellbracketed("(a(b+c)-d)((e+f)") False

H. Given a string of odd length greater 7, return a string made of the middle three chars of a given String
Original String is JhonDipPeta
Middle three chars are Dip
Original String is Jasonay
Middle three chars are son
Given 2 strings, s1 and s2, create a new string by appending s2 in the middle of s1.
append Middle("Chrisdem", IamNewString) → "ChrIamNewStringisdem"

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Assignment: - 09/ *Concept of Inheritance, Abstract class, Interface & Method Overriding*

A. 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.

B. 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 reference to call a function).

C. 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 reference to call a function).

D. 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.

E. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

F. Write a Java program where multiple inheritance is achieved through interface.

G. Write a Java program in which interface is given by name MeanInterface. Method mean() is defined in this interface that calculates the mean of the given numbers arranged in an array. This interface is then extended and the method is defined in this interface that calculates the deviation from the mean value evaluated for each of the numbers.

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Assignment: - 10/*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: - 11/*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 these 2 tasks, invoke the add thread first.

Assignment: - 12/*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: - 13/*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.

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