Sub. - Object Oriented Programming **Sub. Code - PCC-CS593**
Discipline - IT **Semester - 5th**
Full Marks - 60 **Time: 3 Hrs.**
Marks Distribution: Problem Definition-10, Coding- 20, Output- 10, Viva- 20
[Note: For all programs take input using Scanner class/BufferedReader class/Command Line Argument]

1. a) Create a class EMP having instance variable name and id. Create its subclass (say Scientist) which has instance variable no_of_publication and experience. Now create its subclass, say Dscientist which has instance variable award. Put a method: public String toString(){ } in every class where you describe about the class and from main create object of each class and print each object.
b) Convert a sentence into array of String and display the array and also in reverse order.

2. a) Write a java program to find all Prime number numbers within a given range.
b) Design a class to represent a *Bank Account*. Include the following things:
Fields
- ❖ Name of the depositor
- ❖ Account number
- ❖ Type of account
- ❖ Balance amount in the account

Methods
- To assign initial values
- To deposit an amount
- To withdraw an amount after checking balance
- To display the name and balance

3. a) Create a class which contains an inner class. Show that inner class can use member of outer class directly, but Outer class can use member of Inner class only through its object. Check the name of class file, you created.
b) Write a java program to find GCD/HCF of two numbers.

4. a) Create a class with two methods, f( ) and g( ). In g( ), throw an exception of a new type that you define. In f( ), call g( ), catch its exception and, in the catch clause, throw a different exception (of a second type that you define). Test your code in main( ).
b) Write a JAVA Program to calculate the Sum of Series ($1+X+X^2+X^3+X^4+$.....).

5. a) Create two interfaces, each with two methods. Inherit a new interface from the two, adding a new method. Create a class by implementing the new interface and also inheriting from a concrete class. In main (), create an object of derived class and call the methods. [do all without package statement]
b) Write a java program to print Fibonacci series within a given range. (Where n must be user input).

6. a) Write a program for simple calculator using swing.
b) Create an interface named Shape with a field pie (=3.14). Create two subclasses of it named Circle and Rectangle create object of the two classes and calculate their area.

7. a) Create a moving banner which moves a string from right to left.(Here background color set as green and font color set as blue and font type as TimesNewRoman).
b) Create a class and test if method overloading holds good for return type of method or not.

8. a) Write a program to display system clock (digital) with time continuously updated per second.

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b) Define an object reference and initialize it to null. Try to call a method through this reference. Now wrap the code in a try-catch clause to catch the exception.

9. a) Write a program to determine sum of the following series for given value of n: $1 - 1/2^2 + 1/3^2 \cdots\cdots\cdots + 1/n^2$

b) Write a java program to find out the smallest word in a given string as input, hence convert smallest word in uppercase (without using toUpperCase() method) and display the entire string.
[For example Hello Java Lab changed to Hello Java LAB].

10. a) Create an abstract class with three abstract methods check whether you can we override only few methods(not all methods) in subclass or not.

b) Create a class with variable(s) and method(s) (all will be default accessed) under package pOne. Now create a class under package pTwo, which is subclass of firstly created class. In the method here (i.e. class of pTwo) call variable(s) and method(s) of previous class (i.e. class of pOne). If errors come, rectify them. Now from main method (under any directory) access second class's members.

11. a) Inherit a class from Thread and override the run( ) method. Inside run( ), print name of thread , and then call sleep( ). Repeat this three times, then return from run( ). Put a start-up message in the constructor. Make your thread object and main thread run to see what happens.

b) Write code to generate and catch an ArrayIndexOutOfBoundsException.

12. a) Demonstrate that a derived-class constructor cannot catch exceptions thrown by its base-class constructor.

b) Write a JAVA Program to find Area and Circumference of Circle using Constructors.

13. a) WAP that demonstrates the ArithmeticException is actually an input output error.

b) Check without having any abstract method/s whether a class can be abstract; if so, then use that concrete method/s from another class having main method.

14. a) Show that ordinary block is executed when object is created and also the order of execution of these blocks (for multiple blocks/ inherited block).

b) Create an interface containing three methods, in a package 'pkgOne'. Implement the interface from a class under package pkgTwo. From main, under working directory, create object of the class and call methods of interface.

15. a) Create an interface named Shape with a field pie (=3.14). Create two subclasses of it named Circle and Rectangle create object of the two classes and calculate their area.

b) Assume that a bank maintains two kinds of account for its customers, one called savings account and other called current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance (say Rs. 1000) and if the balance falls below this level a service charge is imposed (say Rs. 100).

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Create a class Account that stores customer name, account number and type of account. From this class derive two classes Curr_Acct and Savn_Acct respectively to make them more specific to their requirements. Include the necessary methods to achieve the following tasks:

a. Accept deposit from a customer and update the balance.
b. Display the balance.
c. Compute and deposit interest.
d. Permit withdrawal and update the balance.
e. Check for minimum balance, impose penalty, if necessary, and update the balance.

Use constructors to initialize the class members.

16. a) Create a class with a method void show () and make 3 subclasses of it and all subclasses have void show () method overridden and call those methods using their class references.
b) Show that static block is executed at the time of class loading and also the order of execution of these blocks (for multiple blocks/ inherited block).

17. a) Write a program to create a user defined exception named PayOutOfBoundsException (provided the monthly salary of a person is less than Rs. 10,000 /-) and fire the exception.
b) Write a demo program to illustrate ‘throws’ versus method overriding.

18. a) Implement a class from Runnable and override the run( ) method. Inside run( ), print full qualified name of thread, and then call sleep( ). Repeat this three times, then return from run( ). Put a start-up message in the constructor. Make your thread object and main thread run to see what happens.
b) Write a program to find the reverse of a given integer number. (Take input using command-line argument)

19. a) Write a method called delete (String str, int m) that returns the input string with the m-th element removed.
b) Implement program of locking of common method by several threads. (Using the keyword ‘synchronized’).

20. a) Write a program to find the roots of the quadratic equation $ax^2 + bx + c = 0$ where a, b and c are constants.
b) Create two interfaces, each with two methods. Inherit a new interface from the two, adding a new method. Create a class by implementing the new interface and also inheriting from a concrete class. In main(), create an object of derived class and call the methods.

21. a) Write a java program to find all Armstrong number numbers within a given range.
b) 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 ten square.

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22. a) Implement program of locking of common method by several threads. (Using the synchronized method).
b) Create a class called Television has the following attributes:
Maker, Size of the screen, Date of purchase of the TV, Is it is a color TV
Define a class Television. Define a method for displaying the attributes value of a TV.

23. a) Write a program to use join() and isAlive() in Multi-Threading.
b) By method overloading calculate the area and volume of Cube and Cone.

24. a) Create a class B, make one instance and one static variable, one instance method and one static method use those variables and methods from main method declared in same class.
b) WAP of Inter thread communication: Consumer consumes item produced by Producer with proper synchronization.

25. a) 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.
b) Create a class which contains an inner class. Show that inner class can use member of outer class directly, butOuter class can use member of Inner class only through its object. Check the name of class file, you created.

26. a) Create a class with variable(s) and method(s) (all will be default accessed) under package pOne. Now create aclass under package pTwo, which is subclass of firstly created class. In the method here (i.e. class of pTwo) callvariable(s) and method(s) of previous class (i.e. class of pOne). If errors come, rectify them. Now from Main (under working directory) access second class's members.
b) Write a java program to find GCD/HCF of n numbers, where n is given by the user.

27. a) Create two interfaces, each with one method. Inherit a new interface from the two, adding a new method. Create a class by implementing the new interface and also inheriting from a concrete class having a concrete method. In main (), create an object of derived class and call those methods.
b) Make three threads with names (by extending thread), set their priority and run them to see what happens.

28. a) Write a Java program to retrieve an element (at a specified index) from a given array list if index is outside of size then print an exception.
b) Modify the above program to accomplish the following:
- To delete an item in the list
- To add an item at a specified location in the list.
- To add an item at the end of the list.
- To print the contents of the ArrayList.

29. a) Write a Java program to iterate through all elements in a linked list starting at the specified position.

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b) Write a Java program to iterate a linked list in reverse order starting at the specified position.

30. a) Write a Java program to sort the elements in descending order in Linked List.
b) Write a Java program to display the elements and their positions in reverse order in a linked list.

31. a) Write a Java program to compare two hash set return true if two hash set are same false if at least one element hash sets are different .
b) Write a java program to check whether an element is present in LinkedList during insertion of the elements.

32. a) Write a Java program to remove the elements which are greater than a specific elements from a hash set.
b) Write a Java program to compare two sets and retain elements which are distinct in the sets.

33. a) Write a Java program to copy all of the contents <key, value> from the specified map to another map and if there is any duplicate value then make it double.
b) Write a Java program to count the number of key and unique values in a collection.

34. a) Write a Java program to retrieve an element (at a specified index) from a given array list if index is outside of size then print an exception.
b) Write a program in Java that accepts a shopping list of five items from the command line and stores them in a ArrayList.

35. a) Suppose you have a BankAcc with an initial amount of $50 and you have to add some more amounts to it. Create a class 'AddAmount' with a data member named 'amount' with an initial value of $50. Now make two constructors of this class as follows:
i - without any parameter - no amount will be added to the BankAcc
ii - having a parameter which is the amount that will be added to BankAcc
Create object of the 'AddAmount' class and display the final amount in BankAcc.
b) Create a class named 'Programming'. While creating an object of the class, if nothing is passed to it, then the message "I love programming languages" should be printed. If some String is passed to it, then in place of "programming languages" the name of that String variable should be printed. For example, while creating object if we pass "Java", then "I love Java" should be printed.