



**BHARATI VIDYAPEETH'S**  
**INSTITUTE OF COMPUTER APPLICATIONS & MANAGEMENT (BVICAM)**  
(Affiliated to Guru Gobind Singh Indraprastha University, Approved by AICTE, New Delhi)  
A-4, Paschim Vihar, Rohtak Road, New Delhi-110063, Visit us at: <http://www.bvicam.in/>

Course Code: MCA-109

Course Name: Java Programming

## **Assignment 1**

(Based on Unit-I & II)

Q 1. A positive integer is called a perfect number if the sum of all its factors (excluding the number itself, i.e., proper divisor) is equal to its value.

*For example*, the number 6 is perfect because its proper divisors are 1, 2, and 3, and  $6=1+2+3$ ; but the number 10 is not perfect because its proper divisors are 1, 2, and 5, and  $10 \neq 1+2+5$ .

A positive integer is called a deficient number if the sum of all its proper divisors is less than its value.

*For example*, 10 is a deficient number because  $1+2+5 < 10$ ; while 12 is not because  $1+2+3+4+6 > 12$ .

Design an JSE class structure for the following constructs-

- A boolean method called *isPerfect(int aPosInt)* that takes a positive integer, and return true if the number is perfect.
- A boolean method called *isDeficient(int aPosInt)* to check for deficient numbers.
- public static boolean isPerfect(int aPosInt);
- public static boolean isDeficient(int aPosInt);

Using the methods, create a class called PerfectNumberList that prompts user for an upper bound (a positive integer), and lists all the numbers that are neither deficient nor perfect.

Q 2. An **Employee Resource Planner** for FooCorporation Limited performs some of the basic employee management functionalities.

The classes *Employee*, *PermanentEmployee*, *TemporaryEmployee* such that the class *Employee* acts as the base class for the other two classes.

Add appropriate data members & functions to the base class.

The base class should contain an abstract function to calculate net salary.

The class **PermanentEmployee** should

1. Contain data members for storing BasicSalary, HRAPercent, DAPercent, PFPercent
2. Provide body for the abstract function, contained in the base class, to calculate net salary on basis of the data given above.

The class **TemporaryEmployee** should

1. Contain data members for storing HourlyWages, HoursWorked
2. Provide body for the abstract function, contained in the base class, to calculate wages on basis of the data given above.

Design the above classes and demonstrate dynamic binding. Your application should provide options to:

1. Add data for permanent employee
2. Add data for temporary employee
3. Calculate salary of an employee given his/her empno.

- Q 3. A **Financial Calculator** to calculate the SimpleInterest and CompoundInterest by taking command line values for principal, rate and time.

Extend the code to calculate 'Final Value' of investment (V) of an investment (principal P) compounded yearly for T years at interest rate R is given by the formula:

$$V = P (1 + R)^T$$

Perform the above code using a function and call it in main().  
Make another class and a function in it to perform the above task.

- Q 4. Construct a **character counter** that inputs a piece of text that is analyzed character by character to determine the vowels, spaces and letters used.

Fill in the code that computes the number of spaces, vowels, and consonants.

```
public class StringCharacters {
public static void main(String[] args)
{
String text = "To be or not to be, that is the question;"
+"Whether this nobler in the mind to suffer"
+" the slings and arrows of outrageous fortune,"
+" or to take arms against a sea of troubles,"
```

```

+" and by opposing end them?";
int spaces = 0, vowels = 0, letters = 0; //YOUR CODE HERE
System.out.println("The text contained vowels: " + vowels + "\n" + consonants " +
(letters - vowels) + "\n"+ spaces: " + spaces);
}
}

```

- Q 5. Develop an **employee pay generator** that works on the following rules-
1. An employee gets paid (hours worked) × (base pay), for each hour up to 40 hours.
  2. For every hour over 40, they get overtime = (base pay) × 1.5.
  3. The base pay must not be less than the minimum wage (\$8.00 an hour).
  4. If it is, print an error. If the number of hours is greater than 60, print an error message.
- Q 6. A number java application 'MyNumber.java' that performs following operations on a variable 'num' of type double. Code to include the following functionality:
1. Finds the round value of 'num' and stores the result in a variable numRound of type double.
  2. Finds the ceil value of 'num' and stores the result in a variable numCeil of type double.
  3. Finds the floor value of 'num' and stores the result in a variable numFloor of type double
  4. Cast 'num' to type int and stores the result in a variable
- Q 7. Elaborate the concept of **Polling**. What are the solutions that Java provides for polling problem in multithreading? Why aren't *wait()*, *notify()* and *notifyAll()* methods of Thread Class. Give a short code snippet to show the use of *wait()* and *join()*.
- Q 8. Illustrate the need for **class nesting**? Draw the Inner Classes Hierarchy. Give short code snippets to illustrate:
1. Static Inner Class
  2. Method Local Inner Class
- Q 9. Justify does java implement the concept of **Object Persistence**? Identify the prime motivations for *Serialization*. How does **Serializable Interface** differ from **Externalizable Interface**?
- Q 10. Explain the **Three-way Handshake** in **TCP/IP sockets**. What are *factory methods*? How are they used in *InetAddress* Class? Name some common factory methods in socket programming.