**Section A**

*(Compulsory – Short Answer Questions)****[40 Marks]***

1. *Define the following terms:  
   a) Encapsulation  
   b) Constructor Overloading  
   c) Polymorphism****[3 × 2 = 6 marks]***
2. *Differentiate between:  
   a) Static and Non-Static Methods  
   b) Public and Private Access Modifiers****[2 × 2 = 4 marks]***
3. *Write a Java expression for the following mathematical formula:  
   S=a2+b2+x2yS = \sqrt{a^2 + b^2} + \frac{x^2}{y}S=a2+b2​+yx2​****[2 marks]***
4. *What will be the output of the following Java code snippet?*

int x = 5, y = 10;

System.out.println("Sum = " + (x + y));

System.out.println("Difference = " + (x - y));

***[2 marks]***

1. *State the use of the following methods from the String class:  
   a) charAt()  
   b) substring()  
   c) compareTo()****[3 marks]***
2. *Write a Java program to calculate the factorial of a given number using iteration.****[6 marks]***
3. *Explain the concept of Wrapper Classes with an example.****[3 marks]***
4. *What is the difference between Linear Search and Binary Search?****[4 marks]***
5. *Write a code snippet to demonstrate method overloading.****[4 marks]***
6. *Write a program to input an integer and determine whether it is a prime number.****[6 marks]***

**Section B**

*(Programming Problems – Choose Any Four)*  
**[60 Marks]**

**Question 10:** Write a Java program to input a string and count the number of vowels, consonants, and spaces in it.  
**[15 marks]**

**Question 11:** Write a program to implement Bubble Sort to arrange a list of integers in ascending order.  
**[15 marks]**

**Question 12:** A class Rectangle has attributes length and breadth. Write methods to:  
a) Initialize the dimensions using a constructor.  
b) Calculate and display the area and perimeter.  
**[15 marks]**

**Question 13:** Write a Java program to input a number and check if it is an Armstrong number.  
*(An Armstrong number of n digits is equal to the sum of its digits raised to the power n. E.g., 153 = 13+53+331^3 + 5^3 + 3^3).*  
**[15 marks]**

**Question 14:** Write a program to input an array of integers and search for a given element using the Binary Search method.  
**[15 marks]**

**Question 15:** Create a class Student with attributes name, rollNo, and marks. Implement methods to:  
a) Accept student details  
b) Calculate and display the grade based on marks  
*(Grading system: >90: A, 75–90: B, 50–75: C, <50: D)*  
**[15 marks]**