DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.M.S. COLLEGE OF ENGINEERING
(AUTONOMOUS COLLEGE UNDER VTU,BELGAUM)
BANGALORE-560019

2023-2024

OBJECT ORIENTED PROGRAMMING LAB

Submitted by

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Semester : III Semester

Section : CSE-3B

USN-1BM22CS354

Submitted to
SHRAVYA AR

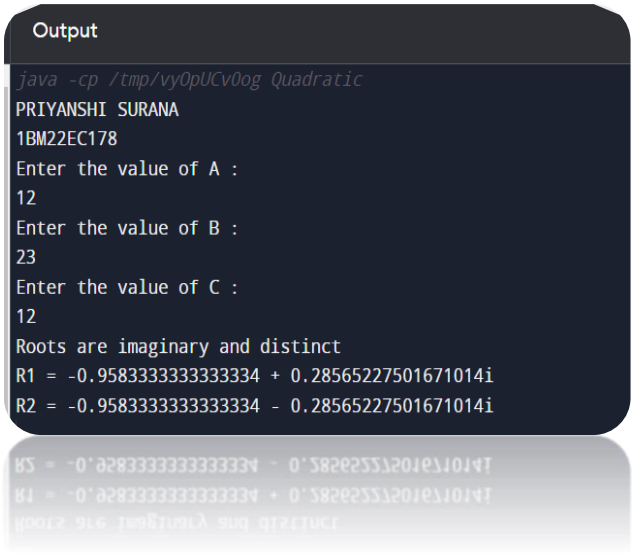
1)Develop a Java program that prints all real solutions to the quadratic equation ax^2 +bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminant b^2 -4ac is negative, display a message stating that there are no real solutions.

CODE-

```
import java.util.Scanner;
class Quadratic{
   public static void main(String args[]){
      System.out.println("PRIYANSHI SURANA");
      System.out.println("1BM22EC178");



      int a,b,c,D;
      Scanner sc=new Scanner(System.in);
      System.out.println("Enter the value of A :");
      a=sc.nextInt();
      System.out.println("Enter the value of B :");
      b=sc.nextInt();
      System.out.println("Enter the value of C :");
      c=sc.nextInt();
      D=(b*b)-(4*a*c);
      if(D>0){
         System.out.println("Roots are real and distinct.");
         double r1=(-b + Math.sqrt(D))/(2*a);
         double r2=(-b - Math.sqrt(D))/(2*a);
         System.out.println("R1 = "+r1);
         System.out.println("R2 = "+r2);
      }
      else if(D==0){
         System.out.println("Roots are real and equal.");
         double r=(-b)/(2*a);
         System.out.println("R1 = "+r);
         System.out.println("R2 = "+r);
      }
      else{
         System.out.println("Roots are imaginary and distinct");
```

```
        double x = (double)-b/(2*a);
        double y = Math.sqrt(-D)/(2*a);
        System.out.println("R1 = "+x+" + "+y+"i");
        System.out.println("R2 = "+x+" - "+y+"i");
    }
 }
}
```

OUTPUT



2)Develop a JAVA program to create a class Book which contains four members:name,author,price,num_pages. Include a constructor to set the values for the members.Include methods to set and get the details of the objects.Include a toSTring() method that could display the complete details of the book.

Develop a program to create n book objects.

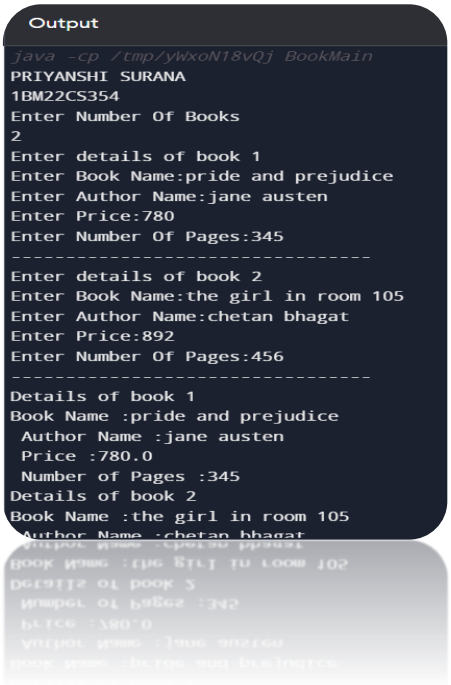
CODE-

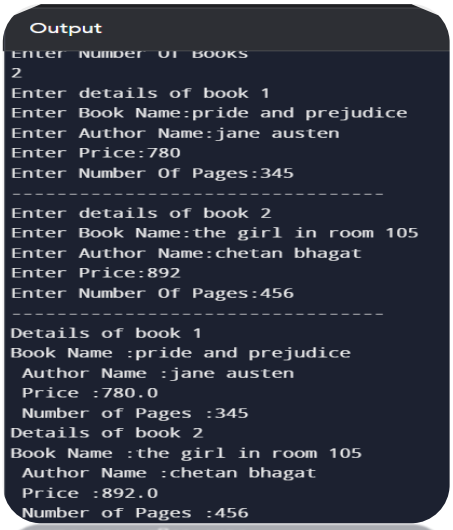
```
import java.util.Scanner;
class Book{
        String name;
        String author;
        double price;
        int num_pages;

        Book(String name,String author,double price,int num_pages){
        this.name=name;
        this.author=author;
        this.price=price;
        this.num_pages=num_pages;
        }

        void setDetails(){
                name=name;
                author=author;
                price=price;
                num_pages=num_pages;
        }

        void getDetails(){
                Scanner s = new Scanner(System.in);
```

```
                System.out.print("Enter Book Name:");
                name=s.nextLine();
                System.out.print("Enter Author Name:");
                author=s.nextLine();
                System.out.print("Enter Price:");
                price=s.nextDouble();
                System.out.print("Enter Number Of Pages:");
                num_pages=s.nextInt();
                System.out.println("---------------------------------");
        }

        public String toString(){
                return ("Book Name :"+name+"\n Author Name :"+author+"\n Price :"+price+"\n Number of
Pages :"+num_pages);
        }
}

class BookMain{
        public static void main(String args[]){
          System.out.println("PRIYANSHI SURANA");
    System.out.println("1BM22EC178");
                Scanner s = new Scanner(System.in);
                int n,i;
                System.out.println("Enter Number Of Books");
                n=s.nextInt();
                Book[] books = new Book[n];
                for(i=0;i<n;i++){

                        System.out.println("Enter details of book "+(i+1));
                        books[i]=new Book(" "," ",0.0,0);
                        books[i].getDetails();
                }
                for(i=0;i<n;i++){
                        System.out.println("Details of book "+(i+1));
```

```
System.out.println(books[i]);
                }
        }}
```

OUTPUT-





3) Develop a JAVA program to create a class bankvalues ,include classes account,curracct

And display the same

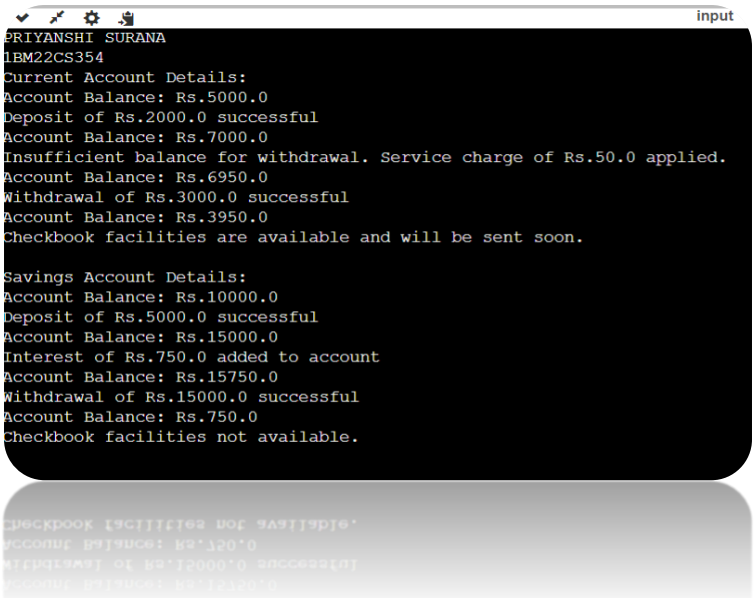
Develop a program to create bank details

```
class Account
   String customerName;
   int accountNumber;
   String accountType;
   double balance;
   Account(String name, int accNo, String type, double bal) {
      customerName = name;
      accountNumber = accNo;
      accountType = type;
      balance = bal;
   }
   void deposit(double amount) {
      balance += amount;
      System.out.println("Deposit of Rs." + amount + " successful");
   }
   void displayBalance() {
      System.out.println("Account Balance: Rs." + balance);
   }
   void withdraw(double amount) {
      if (balance - amount >= 0) {
         balance -= amount;
         System.out.println("Withdrawal of Rs." + amount + " successful");
      } else {
         System.out.println("Insufficient balance for withdrawal");
      }
   }
}
class CurAcct extends Account {
   double minimumBalance;
   double serviceCharge;
   CurAcct(String name, int accNo, String type, double bal, double minBal, double charge) {
```

```
    super(name, accNo, type, bal);
    minimumBalance = minBal;
    serviceCharge = charge;
  }
  void withdraw(double amount) {
    if (balance - amount >= minimumBalance) {
      balance -= amount;
      System.out.println("Withdrawal of Rs." + amount + " successful");
    } else {
      System.out.println("Insufficient balance for withdrawal. Service charge of Rs." + serviceCharge + "
applied.");
      balance -= serviceCharge;
    }  }
  void checkbook(){
    System.out.println("Checkbook facilities are available and will be sent soon.");
  }}
class SavAcct extends Account {
  double interestRate;
  SavAcct(String name, int accNo, String type, double bal, double rate) {
    super(name, accNo, type, bal);
    interestRate = rate;
  }
  void computeInterest() {
    double interest = balance * (interestRate / 100);
    balance += interest;
    System.out.println("Interest of Rs." + interest + " added to account");
  }
  void checkbook(){
    System.out.println("Checkbook facilities not available.");
  }
}
public class Bank {
  public static void main(String[] args) {
    System.out.println("PRIYANSHI SURANA")
```

```
System.out.println("1BM22CS354");
        CurAcct currentAccount = new CurAcct("Monish", 123456, "Current", 5000, 1000, 50);
        SavAcct savingsAccount = new SavAcct("Navaneeth", 654321, "Savings", 10000, 5);
        System.out.println("Current Account Details:");
        currentAccount.displayBalance();
        currentAccount.deposit(2000);
        currentAccount.displayBalance();
        currentAccount.withdraw(7000);
        currentAccount.displayBalance();
        currentAccount.withdraw(3000);
        currentAccount.displayBalance();
        currentAccount.checkbook();
        System.out.println("\nSavings Account Details:");
        savingsAccount.displayBalance();
        savingsAccount.deposit(5000);
        savingsAccount.displayBalance();
        savingsAccount.computeInterest();
        savingsAccount.displayBalance();
        savingsAccount.withdraw(15000);
        savingsAccount.displayBalance();
        savingsAccount.checkbook();
    }
}
```

OUTPUT-



4) Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( )Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

CODE-

```
import java.util.*;
abstract class Shape{
   int dim1;
   int dim2;

   Shape(int dim1, int dim2){
      this.dim1=dim1;
      this.dim2=dim2;
   }
abstract void printArea();
}
class Rectangle extends Shape{
   Rectangle(int length, int width){
      super(length,width);
   }
   void printArea(){
      double area=dim1*dim2;
      System.out.println("Area of Rectangle : "+area);
   }
}
class Triangle extends Shape{
   Triangle(int base, int height){
      super(base,height);
   }
   void printArea(){
      double area=0.5*dim1*dim2;
      System.out.println("Area of Triangle : "+area);
   }
}
class Circle extends Shape{
```

```
    Circle(int radius){
        super(radius,0);
    }
    void printArea(){
        double area=Math.PI *dim1*dim1;
        System.out.println("Area of Circle : "+area);
    }
}
public class ShapeMain{
    public static void main(String args[]){
        System.out.println("PRIYANSHI SURANA");
        System.out.println("1BM22CS354");
        Scanner in = new Scanner(System.in);
        System.out.print("Enter Length of Rectangle:");
        int length = in.nextInt();
        System.out.print("Enter Width of Rectangle:");
        int width = in.nextInt();
        System.out.print("Enter Base of Triangle:");
        int base =in.nextInt();
        System.out.print("Enter Height of Triangle:");
        int height = in.nextInt();
        System.out.print("Enter Radius of Circle:");
        int radius=in.nextInt();
        Rectangle rectangle = new Rectangle(length,width);
        Triangle triangle=new Triangle(base,height);
        Circle circle = new Circle(radius);
        rectangle.printArea();
        triangle.printArea();
        circle.printArea();

    }
}
```

OUTPUT-

```
PRIYANSHI SURANA
1BM22CS354
Enter Length of Rectangle:2
Enter Width of Rectangle:4
Enter Base of Triangle:6
Enter Height of Triangle:8
Enter Radius of Circle:3
Area of Rectangle : 8.0
Area of Triangle : 24.0
Area of Circle : 28.274333882308138
```

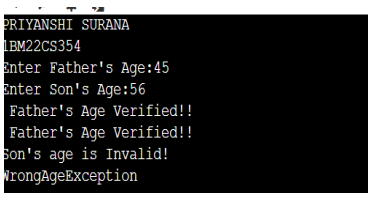
5) /*Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called "Father" and derived class called "Son" which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age<0. In Son class, implement a constructor that cases both father and son's age and throws an exception if son's age is >=father's age */

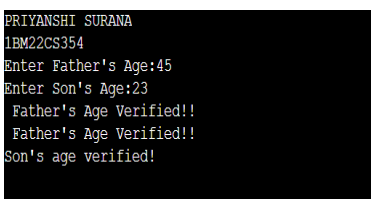
CODE-

```
import java.util.*;
class WrongAgeException extends Exception{
   WrongAgeException(String msg){
      System.out.println(msg);
   }
}
class Father{
   int age;
   Father(int age) throws WrongAgeException {
      this.age=age;
      if(age<0){
         throw new WrongAgeException("Age Can't be less than zero!");
      }
      else{
         System.out.println(" Father's Age Verified!!");
      }
   }
}
class Son extends Father{
   int sonage;
   Son(int age,int sonage)throws WrongAgeException{
      super(age);
      this.sonage=sonage;

      if(sonage<0 || sonage>=age){
      throw new WrongAgeException("Son's age is Invalid!");
   }
```

```
    else{
        System.out.println("Son's age verified!");
    }
}
}
class Age{
    public static void main(String args[]){
        System.out.println("PRIYANSHI SURANA");
        System.out.println("1BM22CS354");
        Scanner in=new Scanner(System.in);
        int age,sonage;
        System.out.print("Enter Father's Age:");
        age=in.nextInt();
        System.out.print("Enter Son's Age:");
        sonage=in.nextInt();
        try{
        Father father = new Father(age);
        }
        catch (Exception e){
            System.out.println(e);
        }
        try{
            Son son = new Son(age,sonage);
            }
            catch (Exception e){
                System.out.println(e);
            }
    }
}
```

OUTPUT-





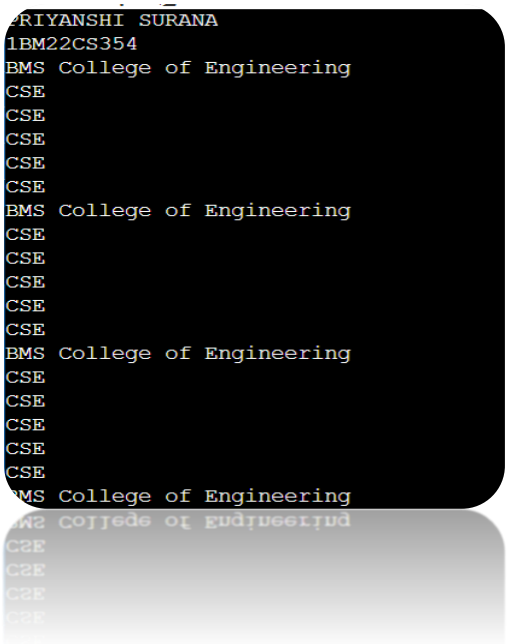
6)Write a program which creates two threads, one thread displaying “BMS College of Engineering” once every ten seconds and another displaying “CSE” once every two seconds

CODE-

```
class CollegeThread extends Thread {
    @Override
    public void run() {
        while (true) {
            System.out.println("BMS College of Engineering");
            try {
                Thread.sleep(10000); // Sleep for 10 seconds
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

class DepartmentThread extends Thread {
    @Override
    public void run() {
        while (true) {
            System.out.println("CSE");
            try {
                Thread.sleep(2000); // Sleep for 2 seconds
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

public class Threads {
    public static void main(String[] args) {
        System.out.println("PRIYANSHI SURANA");
```

```
        System.out.println("1BM22CS354");
        // Create and start threads
        CollegeThread collegeThread = new CollegeThread();
        DepartmentThread departmentThread = new DepartmentThread();

        collegeThread.start();
        departmentThread.start();
    }
}
```

OUTPUT-



7)Create a package CIE which has two classes- Student and Internals. The class Student has members like usn, name, sem. The class internals derived from student has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.

1. **Create a folder CIE and save the programs Student.java and Internals.java within it.**
2. **Create a folder SEE and save the program External.java within it.**
3. **Save the Main program outside these two folders.**
4. **Compile Main.java and Execute the Main.class**

CODE-

Student.java (inside CIE package):

```
package CIE;


public class Student {
   public String usn;
   public String name;
   public int sem;


   public Student(String usn, String name, int sem) {
      this.usn = usn;
      this.name = name;
      this.sem = sem;
   }
}
```

Internals.java (inside CIE package):

```
package CIE;


public class Internals extends Student {
   public int[] m = new int[5];


   public Internals(String usn, String name, int sem, int[] marks) {
      super(usn, name, sem);
      this.m = marks;
   }
}
```

External.java (inside SEE package):

```
package SEE;

import CIE.Student;

public class External extends Student {
   public int[] sm = new int[5];

   public External(String usn, String name, int sem, int[] marks) {
      super(usn, name, sem);
      this.sm = marks;
   }
}
```

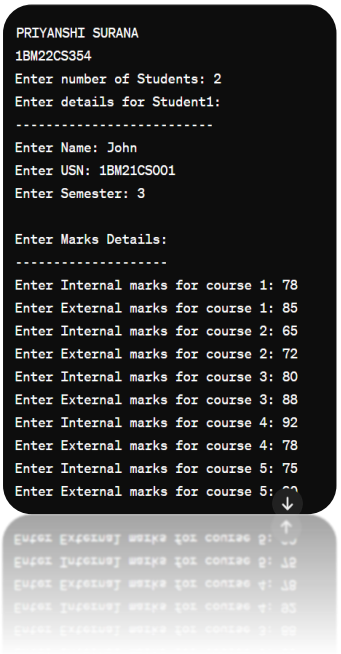
Main.java (outside both packages)

```
import java.util.*;
import CIE.Student;
import CIE.Internals;
import SEE.External;

public class Main {
   public static void main(String args[]) {
      System.out.println("PRIYANSHI SURANA");
      System.out.println("1BM22CS354");
      int fm=0;
      Scanner in = new Scanner(System.in);
      System.out.print("Enter number of Students:");
      int n = in.nextInt();
      Internals[] im = new Internals[n];
      External[] em = new External[n];

      for(int i = 0; i < n; i++) {
         System.out.println("Enter details for Student"+(i+1)+":");
         System.out.println("--------------------------");
         System.out.print("Enter Name:");
```

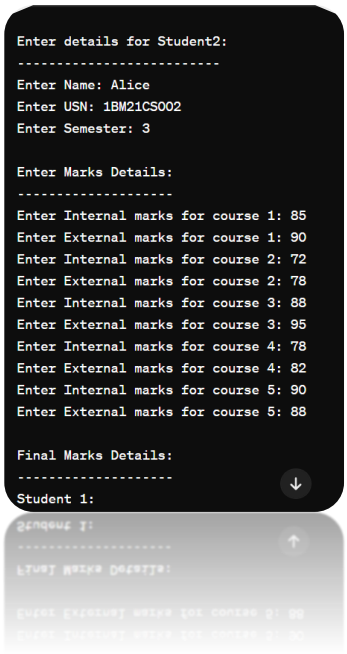
```
    in.nextLine();
    String name = in.nextLine();
    System.out.print("Enter USN:");
    String usn = in.nextLine();
    System.out.print("Enter Semester:");
    int sem = in.nextInt();
    int[] internalMarks = new int[5];
    int[] externalMarks = new int[5];

    System.out.println("\nEnter Marks Details:");
    System.out.println("--------------------");
    for(int j = 0; j < 5; j++) {
       System.out.print("Enter Internal marks for course "+(j+1)+":");
       internalMarks[j] = in.nextInt();
       System.out.print("Enter External marks for course "+(j+1)+":");
       externalMarks[j] = in.nextInt();
    }

    im[i] = new Internals(usn, name, sem, internalMarks);
    em[i] = new External(usn, name, sem, externalMarks);
}

System.out.println("\nFinal Marks Details:");
System.out.println("--------------------");
for(int i = 0; i < n; i++) {
    System.out.println("Student "+(i+1)+":");
    System.out.println("Name:"+im[i].name);
    System.out.println("USN:"+im[i].usn);
    System.out.println("Sem:"+im[i].sem);

    for(int j = 0; j < 5; j++) {
       fm = im[i].m[j] + em[i].sm[j];
       System.out.println("Final Marks Of Course "+(j+1)+":"+fm);
    }
```

```
        System.out.println();
    }
  }
}
```

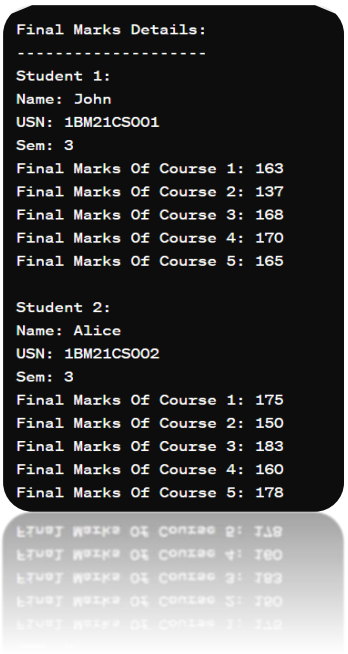
OUTPUT-



```
PRIYANSHI SURANA
1BM22CS354
Enter number of Students: 2
Enter details for Student1:
------------------------
Enter Name: John
Enter USN: 1BM21CS001
Enter Semester: 3

Enter Marks Details:
-------------------
Enter Internal marks for course 1: 78
Enter External marks for course 1: 85
Enter Internal marks for course 2: 65
Enter External marks for course 2: 72
Enter Internal marks for course 3: 80
Enter External marks for course 3: 88
Enter Internal marks for course 4: 92
Enter External marks for course 4: 78
Enter Internal marks for course 5: 75
Enter External marks for course 5:
```



```
Enter details for Student2:
------------------------
Enter Name: Alice
Enter USN: 1BM21CS002
Enter Semester: 3

Enter Marks Details:
-------------------
Enter Internal marks for course 1: 85
Enter External marks for course 1: 90
Enter Internal marks for course 2: 72
Enter External marks for course 2: 78
Enter Internal marks for course 3: 88
Enter External marks for course 3: 95
Enter Internal marks for course 4: 78
Enter External marks for course 4: 82
Enter Internal marks for course 5: 90
Enter External marks for course 5: 88

Final Marks Details:
-------------------
Student 1:
```



```
Final Marks Details:
--------------------
Student 1:
Name: John
USN: 1BM21CS001
Sem: 3
Final Marks Of Course 1: 163
Final Marks Of Course 2: 137
Final Marks Of Course 3: 168
Final Marks Of Course 4: 170
Final Marks Of Course 5: 165

Student 2:
Name: Alice
USN: 1BM21CS002
Sem: 3
Final Marks Of Course 1: 175
Final Marks Of Course 2: 150
Final Marks Of Course 3: 183
Final Marks Of Course 4: 160
Final Marks Of Course 5: 178
```

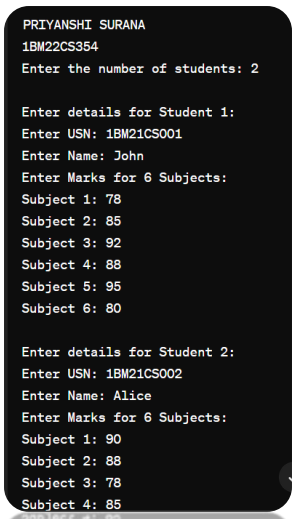
8)Write a Java program to create a class Student with members USN, name, marks(6 subjects). Include methods to accept student details and marks, Also include a method to calculate the percentage and display appropriate details. (Array of student object to be created)

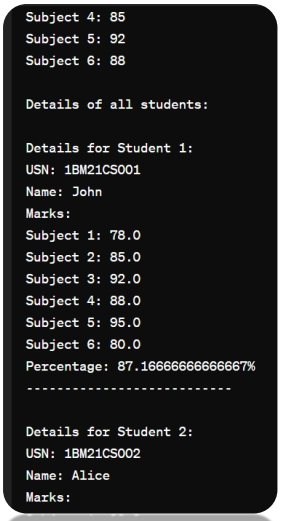
CODE-

```
import java.util.Scanner;


class Student {
  String usn;
  String name;
  double[] marks = new double[6];


  void acceptDetails() {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter USN: ");
    usn = scanner.nextLine();
    System.out.print("Enter Name: ");
    name = scanner.nextLine();
    System.out.println("Enter Marks for 6 Subjects:");
    for (int i = 0; i < 6; i++) {
      System.out.print("Subject " + (i + 1) + ": ");
      marks[i] = scanner.nextDouble();
    }
  }


  double calculatePercentage() {
    double total = 0;
    for (double mark : marks) {
      total += mark;
    }
    return (total / 600) * 100;
  }


  void displayDetails() {
    System.out.println("USN: " + usn);
    System.out.println("Name: " + name);
```

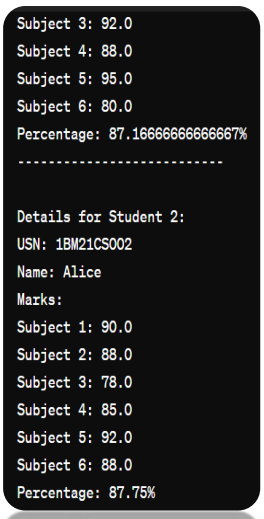
```
        System.out.println("Marks:");
        for (int i = 0; i < 6; i++) {
            System.out.println("Subject " + (i + 1) + ": " + marks[i]);
        }
        System.out.println("Percentage: " + calculatePercentage() + "%");
        System.out.println("----------------------------");
    }
}

public class StudentArray {
    public static void main(String[] args) {
        System.out.println("PRIYANSHI SURANA");
        System.out.println("1BM22CS354");

        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the number of students: ");
        int n = scanner.nextInt();

        Student[] students = new Student[n];

        for (int i = 0; i < n; i++) {
            System.out.println("\nEnter details for Student " + (i + 1) + ":");
            students[i] = new Student();
            students[i].acceptDetails();
        }

        System.out.println("\nDetails of all students:");
        for (int i = 0; i < n; i++) {
            System.out.println("\nDetails for Student " + (i + 1) + ":");
            students[i].displayDetails();
        }
    }
}
```

OUTPUT-


PRIYANSHI SURANA
1BM22CS354
Enter the number of students: 2
Enter details for Student 1:
Enter USN: 1BM21CS001
Enter Name: John
Enter Marks for 6 Subjects:
Subject 1: 78
Subject 2: 85
Subject 3: 92
Subject 4: 88
Subject 5: 95
Subject 6: 80
Enter details for Student 2:
Enter USN: 1BM21CS002
Enter Name: Alice
Enter Marks for 6 Subjects:
Subject 1: 90
Subject 2: 88
Subject 3: 78
Subject 4: 85


Subject 4: 85
Subject 5: 92
Subject 6: 88
Details of all students:
Details for Student 1:
USN: 1BM21CS001
Name: John
Marks:
Subject 1: 78.0
Subject 2: 85.0
Subject 3: 92.0
Subject 4: 88.0
Subject 5: 95.0
Subject 6: 80.0
Percentage: 87.16666666666667%

Details for Student 2:
USN: 1BM21CS002
Name: Alice
Marks:


Subject 3: 92.0
Subject 4: 88.0
Subject 5: 95.0
Subject 6: 80.0
Percentage: 87.16666666666667%

Details for Student 2:
USN: 1BM21CS002
Name: Alice
Marks:
Subject 1: 90.0
Subject 2: 88.0
Subject 3: 78.0
Subject 4: 85.0
Subject 5: 92.0
Subject 6: 88.0
Percentage: 87.75%