JAVA – WEEK 4

CLASSES AND OBJECTS

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2019103013

LEVEL-1

1) With respect to class Employee : include static variable bonusrate (float), count(int) to keep track of objects created, Static method void modifyInterestRate(float val). Member method: double calculateBonus() that finds the bonus of the Employee object. In the display(), print the number of objects created.Write a driver program to test the static, member method and explore static method can access instance variable or invoke instance method.

Employee.java

```
import java.util.*;

public class Employee
{
   int empid;
   String firstname =  new String();
   String lastname = new String();
   double salary = 1000;
   double bonus;

   static int count=0;
   static float bonusrate = 0.5f;

   public Employee () {
      empid = 0;
      firstname = null;
      lastname  = null;
      count++;
   }

   public Employee (int id, String fn, String ln, double sal)
   {
      setEmpid(id);
      setFirstname(fn);
      setLastname(ln);
      setSalary(sal);
```

```
    count++;
}

//SET
public void setEmpid (int id)
{
if (id>0) {
    empid = id;
}
    else
        System.out.println("\n invalid Employee Id");
}
public void setFirstname (String fn)
{
    if (fn!=null)
        firstname = String.valueOf(fn);
    else
        System.out.println("\n invalid firstname");
}
public void setLastname (String ln)
{
    if (ln!=null)
        lastname  = String.valueOf(ln);
    else
        System.out.println("\n invalid lastname");
}
public void setSalary (double sal)
{
    if (sal>0)
        salary = sal;
    else
        System.out.println("\n invalid salary");
}

//GET
public int getEmpid () {
    return empid;
}
public String getFirstname () {
    return firstname;
}
```

```
    public String getLastname () {
        return lastname;
    }
    public double getSalary () {
        return salary;
    }
    public int getTotalEmployeeCount () {
        return count;
    }

    //CALCULATE BONUS
    public double calculateBonus () {
        bonus = (salary*bonusrate)/100;
        return (bonus);
    }

    public String toString () {
        return String.format(" Name of Employee: %s %s, Employee ID: %d, Salary: %.2f, Bonus: %.2f", firstname, last
name, empid, salary, bonus);
    }



    //MODIFY BONUSRATE
    public static void modifyBonusRate (float val)
    {
        bonusrate = val;
    }

    public static void display (Employee [] list, int c)
    {
        System.out.println("\n Total Number of Employees = " + Employee.count);

        for (int i=0; i<c; i++)
        {
            System.out.println(" Eid: " + list[i].empid);
            System.out.println(" Name: " + list[i].firstname + " " + list[i].lastname);
            System.out.println(" Salary: " + list[i].salary + "\n");
        }

    }
}
```

TestEmp.java

```
import java.util.Scanner;

public class TestEmp
{
   public static void main(String[] args)
   {
      Scanner input = new Scanner(System.in);
      final int MAX = 10;

      int n;
      System.out.println("\n Enter 999 in Employee id to quit input intake\n");

      int eid, i=0, x, j;
      double sal, intRate, bonusCash;
      String fname = new String(), lname = new String();

      Employee [] list = new Employee[MAX];

      while (true)
      {
         System.out.println("\n Enter Employee Details: ");

         System.out.print("Employee ID : ");
         eid = input.nextInt();
         input.nextLine();

         if (eid==999)
            break;

         System.out.print("First Name  : ");
         fname = input.nextLine();

         System.out.print("Last Name   : ");
         lname = input.nextLine();

         System.out.print("Salary      : ");
         sal = input.nextDouble();

         list[i] = new Employee(eid, fname, lname, sal);
```

```
            i++;
        }

        System.out.println("\n\n Running Default Employee constructor: ");
        Employee e1 = new Employee();
        System.out.println(e1.toString());

        //INVOKING STATIC METHOD
        if (i>0)
            Employee.display(list, (i));

        System.out.print("\n Enter any Employee id : ");
        x = input.nextInt();
        System.out.print(" Name of Employee = ");
        //ACCESSING STATIC VARIABLE
        for (j=0; j<i; j++)
        {
            if (list[j].empid == x){
                //ACCESSING INSTANCE VARIABLE
                System.out.println(" " + list[j].firstname + " " + list[j].lastname + " ");
            }
        }

        System.out.println("\n The current BonusRate = " + Employee.bonusrate);
        System.out.print(" Do You want to change it? (y/n): ");
        char c = input.next().charAt(0);
        if (c=='y')
        {
            System.out.print(" Enter new BonusRate: ");
            float br = input.nextFloat();

            //ACCESSING INSTANCE METHOD
            System.out.println("\n Old Bonus Amount for Employee ID " + list[0].empid + " = " + list[0].calculateBonus()
);

            //ACCESSING STATIC METHOD
            Employee.modifyBonusRate(br);

            System.out.println("\n New BonusRate = " + Employee.bonusrate + "\n");

            //ACCESSING INSTANCE METHOD
            System.out.println(" New Bonus Amount for Employee ID " + list[0].empid + " = " + list[0].calculateBonus());
```

```
    }


  }
}
```

OUTPUT:

```
Windows PowerShell
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> java TestEmp

 Enter 999 in Employee id to quit input intake


 Enter Employee Details:
Employee ID : 1
First Name  : John
Last Name   : Cena
Salary      : 78000

 Enter Employee Details:
Employee ID : 2
First Name  : King
Last Name   : Cobra
Salary      : 4000

 Enter Employee Details:
Employee ID : 999


 Running Default Employee constructor:
 Name of Employee: null null, Employee ID: 0, Salary: 1000.00, Bonus: 0.00

 Total Number of Employees = 3
 Eid: 1
 Name: John Cena
 Salary: 78000.0

 Eid: 2
 Name: King Cobra
 Salary: 4000.0


 Enter any Employee id : 2
 Name of Employee =  King Cobra

 The current BonusRate = 0.5
 Do You want to change it? (y/n): y
 Enter new BonusRate: 10

 Old Bonus Amount for Employee ID 1 = 390.0

 New BonusRate = 10.0

 New Bonus Amount for Employee ID 1 = 7800.0
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4>
```

2) Define class Librarymember with members: accno(int), accName(String), deposit(double), noofbooks(int) and methods are: void issue(int val) increments the noofbooks by the val value and void return(int n) decrements the number of books by n. Define static variable :static final float fine =1.50; Include float calculatefine(int noofDays) that will calculate the fine amount to be paid for number of days beyond the due date

Librarymember.java

```
public class Librarymember
{
   int accno;
   String accName = new String();
   double deposit;
   int noofbooks;

   static int totalBooksInLib=0;
   static final float fine = 1.50f;
   int dueDays = 20;
   int x=100;  //for default accNo

   public Librarymember ()
   {
      accno = x++;
      accName = null;
      deposit = 0;
      noofbooks = 0;
   }

   public Librarymember (int an, String name, double d, int books)
   {
      accno = an;
      accName = name;
      deposit = d;
      issueBooks(books);
   }

   public void issueBooks (int val)
   {
      noofbooks += val;
      totalBooksInLib += val;
   }
```

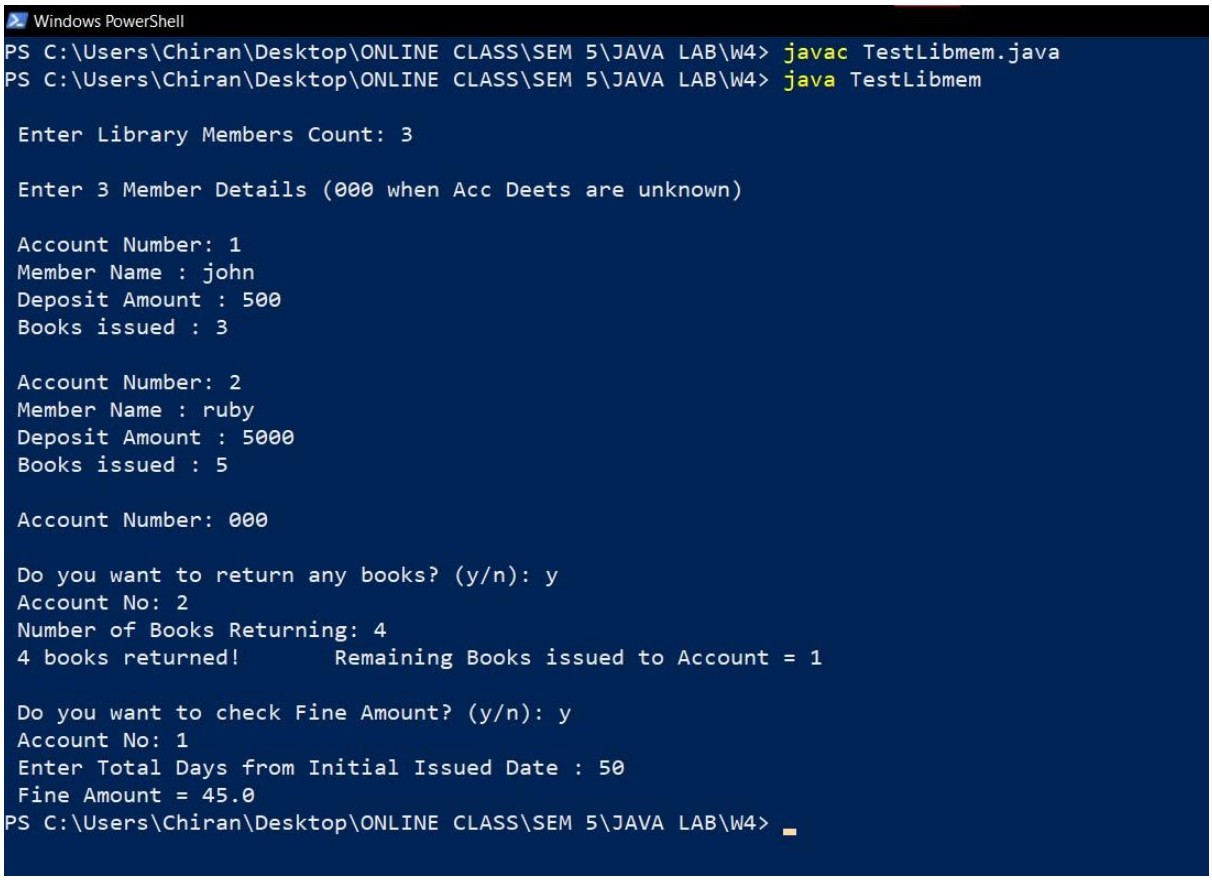
```
  public void returnBooks (int val)
  {
     if (noofbooks<val)
        System.out.println(" Returned book count is greater");
     else
     {
        noofbooks -= val;
        totalBooksInLib -= val;

        System.out.println(" " + val + " books returned! \t Remaining Books issued to Account = " + noofbooks);
     }

  }

  public float calculateFine (int noofDays)
  {
     if (noofDays>dueDays)
        return ( (noofDays-dueDays)*fine );
     else
     {
        System.out.println("\n No need to Pay any Fine! ");
        return 0;
     }
  }
}
```

TestLibmem.java

```
import java.util.Scanner;

public class TestLibmem
{
   public static void main(String[] args)
   {
      Scanner input =  new Scanner(System.in);
      int i, n;

      System.out.print("\n Enter Library Members Count: ");
      n = input.nextInt();

      Librarymember memberz[] = new Librarymember[10];

      System.out.printf("\n Enter %d Member Details (000 when Acc Deets are unknown) \n", n);

      for (i=0; i<n; i++)
      {
         int an, books;
         String name;
         double d;

         System.out.print("\n Account Number: ");
         an = input.nextInt();
         if (an == 000)
         {
            //default constructor
            memberz[i] = new Librarymember();
            continue;
         }
         input.nextLine();
         System.out.print(" Member Name : ");
         name = input.nextLine();

         System.out.print(" Deposit Amount : ");
         d = input.nextDouble();

         System.out.print(" Books issued : ");
         books = input.nextInt();

         memberz[i] = new Librarymember(an, name, d, books);
```

```
    }

    System.out.print("\n Do you want to return any books? (y/n): ");
    char c = input.next().charAt(0);
    if (c=='y')
    {
       System.out.print(" Account No: ");
       int an = input.nextInt();
       System.out.print(" Number of Books Returning: ");
       int retBook = input.nextInt();

       for (i=0; i<n; i++)
       {
          if (memberz[i].accno == an)
          {
             memberz[i].returnBooks(retBook);
          }
       }
    }

    System.out.print("\n Do you want to check Fine Amount? (y/n): ");
    c = input.next().charAt(0);
    if (c=='y')
    {
       System.out.print(" Account No: ");
       int an = input.nextInt();
       System.out.print(" Enter Total Days from Initial Issued Date : ");
       int days = input.nextInt();
       for (i=0; i<n; i++)
       {
          if (memberz[i].accno == an)
          {
             float fineAmt = memberz[i].calculateFine(days);
             if (fineAmt > 0)
                System.out.println(" Fine Amount = " + fineAmt);
          }
       }
    }

  }
}
```

OUTPUT:


Windows PowerShell
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> javac TestLibmem.java
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> java TestLibmem
Enter Library Members Count: 3
Enter 3 Member Details (000 when Acc Deets are unknown)
Account Number: 1
Member Name : john
Deposit Amount : 500
Books issued : 3
Account Number: 2
Member Name : ruby
Deposit Amount : 5000
Books issued : 5
Account Number: 000
Do you want to return any books? (y/n): y
Account No: 2
Number of Books Returning: 4
4 books returned! Remaining Books issued to Account = 1
Do you want to check Fine Amount? (y/n): y
Account No: 1
Enter Total Days from Initial Issued Date : 50
Fine Amount = 45.0
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4>

LEVEL – 2

1) Define class Course with members: courseName(String), courseInstructor(String), noofHours(int), noofCredits(int). The member functions are: default constructor, constructor with arguments, toString() to display the course details, get and set methods.

Include static variable : noofStudentsEnrolled(int)

Static method: void enroll(int n) will add up n students to the noofStudentsEnrolled

Static method: void drop(int n) will reduce n students from the noofStudentsEnrolled

In driver method create objects of Course and test all methods.

CODE:

Course.java

```
public class Course
{
   String courseName = new String();
   String courseInstructor = new String();
   int noofHours;
   int noofCredits;

   //STATIC VARIABLE
   static int noofStudentsEnrolled=0;

   public Course ()
   {
      courseName = null;
      courseInstructor = null;
      noofHours = noofCredits = 0;

      noofStudentsEnrolled++;
   }

   public Course (String cn, String ci, int hours, int creds)
   {
      setCourseName(cn);
      setCourseInstructor(ci);
      setHours(hours);
      setCredits(creds);

      noofStudentsEnrolled++;
```

```
}

//SET METHODS
public void setCourseName (String cn)
{
   if (cn != null)
      courseName = String.valueOf(cn);
}
public void setCourseInstructor (String ci)
{
   if (ci != null)
      courseInstructor = String.valueOf(ci);
}
public void setHours (int hours)
{
   if (hours>0)
      noofHours = hours;
}
public void setCredits (int creds)
{
   if (creds>0)
      noofCredits = creds;
}

//GET METHODS
public String getCourseName ()
{
   return courseName;
}
public String getCourseInstructor ()
{
   return courseInstructor;
}
public int getHours ()
{
   return noofHours;
}
public int getCredits ()
{
   return noofCredits;
}
```

```
    //TO-STRING DISPLAY INFO
    public String toString ()
    {
        return String.format(" Course-Name: %s, Course-
Instructor: %s, Duration: %d hours, Credits: %d", courseName, courseInstructor, noofHours, noofCredits);
    }

    //STATIC METHODS:
    public static void enroll (int n)
    {
        if (n>0)
            noofStudentsEnrolled += n;

        System.out.println("\n Total No. of Students Enrolled = " + noofStudentsEnrolled);
    }

    public static void drop (int n)
    {
        if (n<noofStudentsEnrolled)
            noofStudentsEnrolled -= n;

        System.out.println("\n Total No. of Students Enrolled = " + noofStudentsEnrolled);
    }
}
```

TestCourse.java

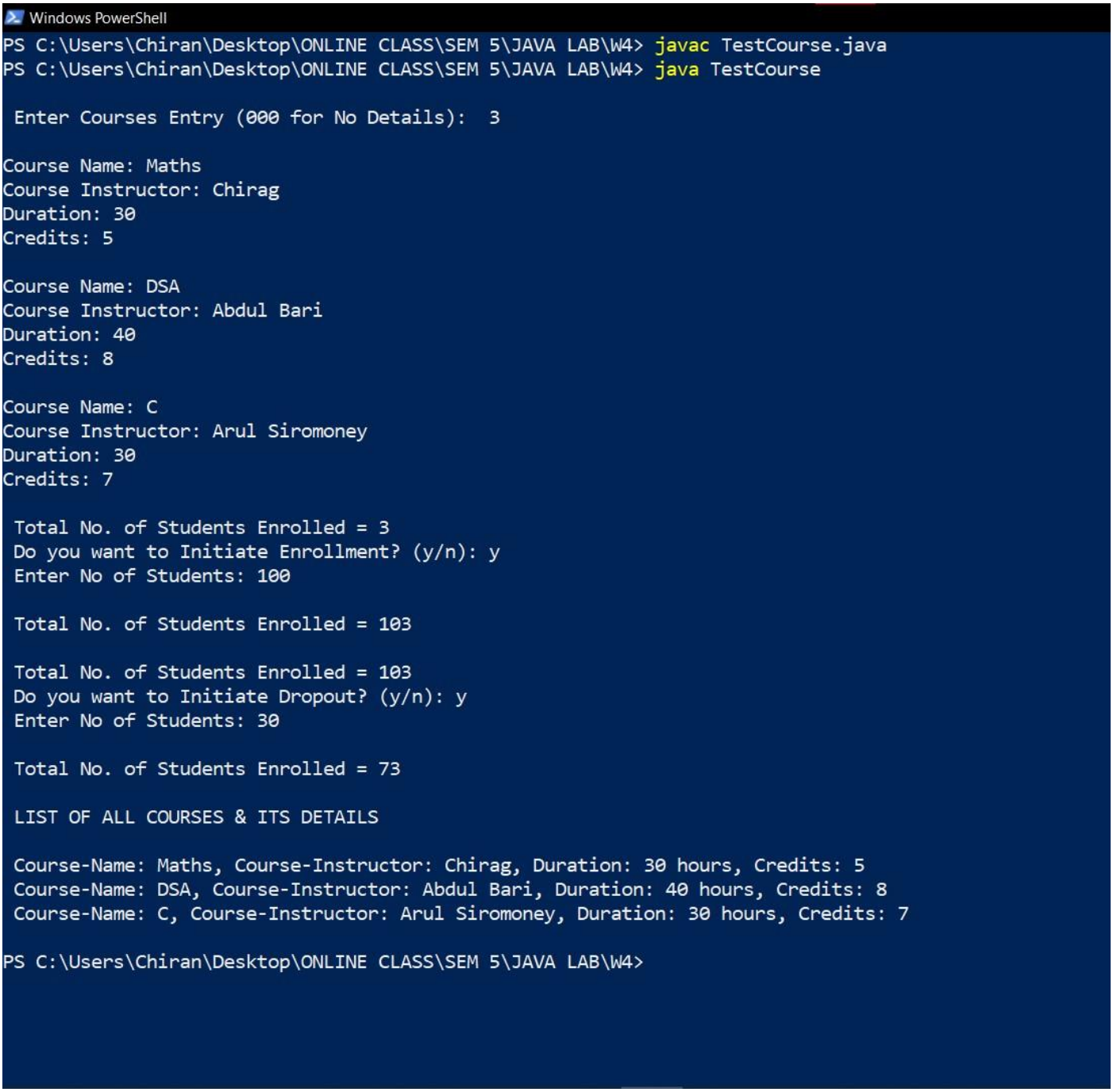
```
import java.sql.ClientInfoStatus;
import java.util.Scanner;

public class TestCourse
{
    public static void main(String[] args)
    {
        Scanner input = new Scanner(System.in);

        int i, n;
        System.out.print("\n Enter Courses Entry (000 for No Details):  ");
        n = input.nextInt();
```

```
    Course cList [] = new Course[n];

    for (i=0; i<n; i++)
    {
        input.nextLine();

        String cn = new String();
        String ci = new String();
        int hours, creds;

        System.out.print("\nCourse Name: ");
        cn = input.nextLine();
        if (cn.equals("000") == true)
        {
            cList[i] = new Course();
            continue;
        }


        System.out.print("Course Instructor: ");
        ci = input.nextLine();


        System.out.print("Duration: ");
        hours = input.nextInt();

        System.out.print("Credits: ");
        creds = input.nextInt();

        cList[i] = new Course(cn, ci, hours, creds);
    }

    enrollForCourse();
    dropFromCourse();
    displayCourses(cList, n);

    input.close();
}

public static void enrollForCourse ()
{
```

```
    Scanner input = new Scanner(System.in);

    System.out.println("\n Total No. of Students Enrolled = " + Course.noofStudentsEnrolled);

    System.out.print(" Do you want to Initiate Enrollment? (y/n): ");
    char c = input.next().charAt(0);
    if (c=='y')
    {
        System.out.print(" Enter No of Students: ");
        int num = input.nextInt();
        Course.enroll(num);
    }

}

public static void dropFromCourse ()
{
    Scanner input = new Scanner(System.in);

    System.out.println("\n Total No. of Students Enrolled = " + Course.noofStudentsEnrolled);

    System.out.print(" Do you want to Initiate Dropout? (y/n): ");
    char c = input.next().charAt(0);
    if (c=='y')
    {
        System.out.print(" Enter No of Students: ");
        int num = input.nextInt();
        Course.drop(num);
    }

}

public static void displayCourses (Course cList[], int n)
{
    int i;
    String res = new String();

    System.out.println("\n LIST OF ALL COURSES & ITS DETAILS \n");
    for (i=0; i<n; i++)
    {
        res = cList[i].toString();
        System.out.println(res);
```

```
    }

    System.out.println();
  }


}
```

OUTPUT:



LEVEL – 3

1) Create class called Gradebook, create an array of Course, initialse and print the details of the Course.

Course.java

```
public class Course
{
   String courseName = new String();
   String courseInstructor = new String();
   int noofHours;
   int noofCredits;

   //STATIC VARIABLE
   static int noofStudentsEnrolled=0;

   public Course ()
   {
      courseName = null;
      courseInstructor = null;
      noofHours = noofCredits = 0;

      noofStudentsEnrolled++;
   }

   public Course (String cn, String ci, int hours, int creds)
   {
      setCourseName(cn);
      setCourseInstructor(ci);
      setHours(hours);
      setCredits(creds);

      noofStudentsEnrolled++;
   }

   //SET METHODS
   public void setCourseName (String cn)
   {
      if (cn != null)
         courseName = String.valueOf(cn);
   }
   public void setCourseInstructor (String ci)
   {
```

```
        if (ci != null)
            courseInstructor = String.valueOf(ci);
    }
    public void setHours (int hours)
    {
        if (hours>0)
            noofHours = hours;
    }
    public void setCredits (int creds)
    {
        if (creds>0)
            noofCredits = creds;
    }

    //GET METHODS
    public String getCourseName ()
    {
        return courseName;
    }
    public String getCourseInstructor ()
    {
        return courseInstructor;
    }
    public int getHours ()
    {
        return noofHours;
    }
    public int getCredits ()
    {
        return noofCredits;
    }

    //TO-STRING DISPLAY INFO
    public String toString ()
    {
        return String.format(" Course-Name: %s, Course-
Instructor: %s, Duration: %d hours, Credits: %d", courseName, courseInstructor, noofHours, noofCredits);
    }

    //STATIC METHODS:
    public static void enroll (int n)
    {
```

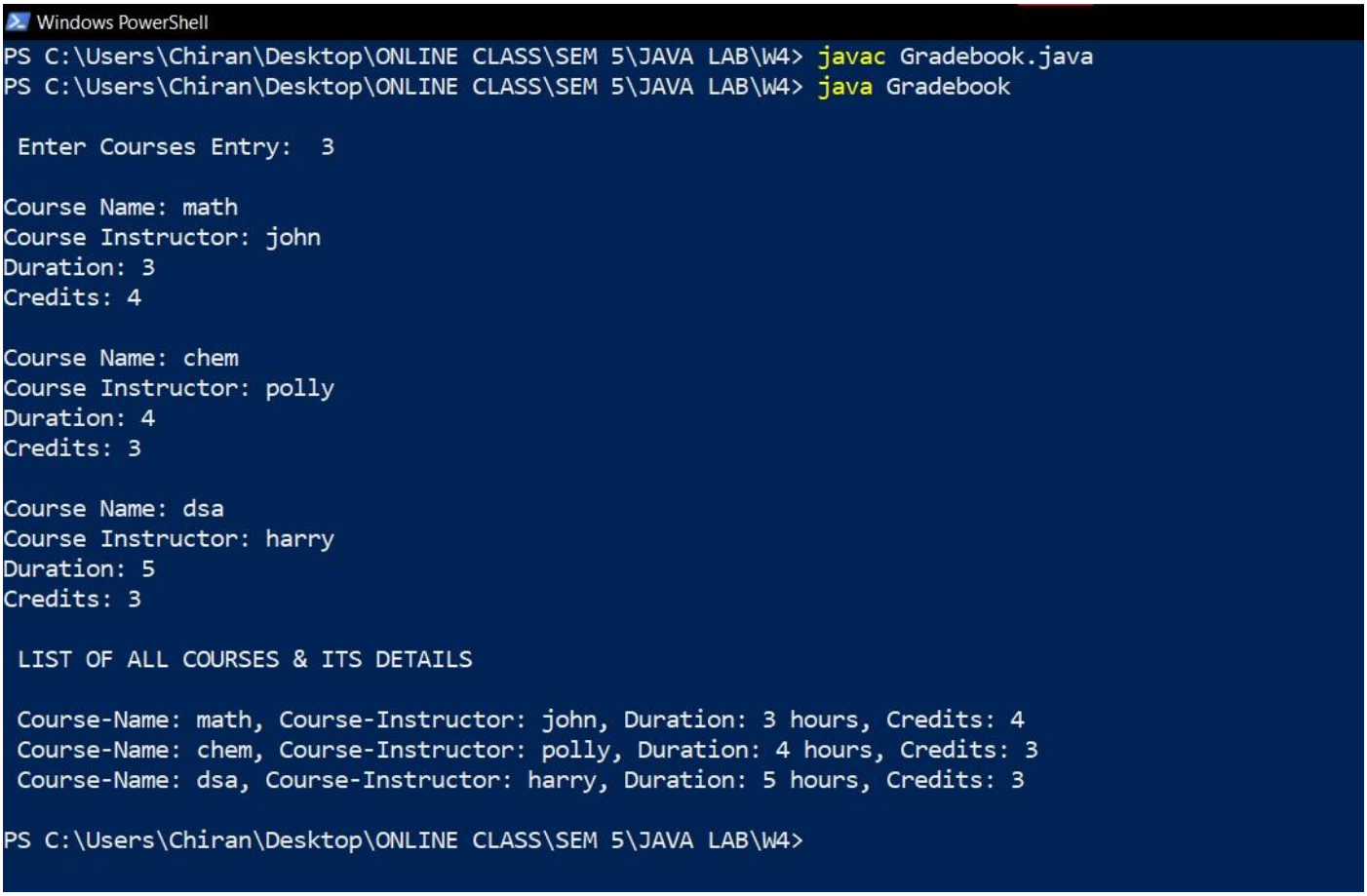
```
    if (n>0)
        noofStudentsEnrolled += n;

    System.out.println("\n Total No. of Students Enrolled = " + noofStudentsEnrolled);
  }

  public static void drop (int n)
  {
    if (n<noofStudentsEnrolled)
        noofStudentsEnrolled -= n;

    System.out.println("\n Total No. of Students Enrolled = " + noofStudentsEnrolled);
  }
}
```

Gradebook.java

```
import java.util.Scanner;

public class Gradebook
{
  public static void main(String[] args)
  {
    Scanner input = new Scanner (System.in);

    int i, n;
    System.out.print("\n Enter Courses Entry:  ");
    n = input.nextInt();

    Course cList2 [] = new Course[n];

    for (i=0; i<n; i++)
    {
        input.nextLine();

        String cn = new String();
        String ci = new String();
        int hours, creds;

        System.out.print("\nCourse Name: ");
        cn = input.nextLine();
```

```
            System.out.print("Course Instructor: ");
            ci = input.nextLine();

            System.out.print("Duration: ");
            hours = input.nextInt();

            System.out.print("Credits: ");
            creds = input.nextInt();

            cList2[i] = new Course(cn, ci, hours, creds);
        }

        displayAllCourses(cList2, n);

    }

    public static void displayAllCourses (Course cList2[], int n)
    {
        int i;
        String res = new String();

        System.out.println("\n LIST OF ALL COURSES & ITS DETAILS \n");
        for (i=0; i<n; i++)
        {
            res = cList2[i].toString();
            System.out.println(res);
        }

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

OUTPUT:


Windows PowerShell
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> javac Gradebook.java
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> java Gradebook
Enter Courses Entry: 3
Course Name: math
Course Instructor: john
Duration: 3
Credits: 4
Course Name: chem
Course Instructor: polly
Duration: 4
Credits: 3
Course Name: dsa
Course Instructor: harry
Duration: 5
Credits: 3
LIST OF ALL COURSES & ITS DETAILS
Course-Name: math, Course-Instructor: john, Duration: 3 hours, Credits: 4
Course-Name: chem, Course-Instructor: polly, Duration: 4 hours, Credits: 3
Course-Name: dsa, Course-Instructor: harry, Duration: 5 hours, Credits: 3
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4>

2) Define class called TestBook with static method: Book search(Book [], String title) which will return the searched Book object if it exists in the array of Book objects. In the TestBook class, create an array of Book Objects and invoke the search method. The Book details returned from the search must be printed and if the returned object is null print the " "Book with title _____ is not found"

Book.java

```
public class Book
{
   String title = new String();
   String author = new String();
   int yearOfPublication;
   double price;

   public Book ()
   {
      title = null;
      author = null;
      yearOfPublication = 0;
      price = 500.00;
   }

   public Book (String book, String writer, int year, double cost)
   {
      setTitle ( book);
      setAuthor ( writer);
      setYearOfPublication ( year);
      setPrice ( cost);
   }

   public void setTitle (String book) {
      if (book!=null)
         title = String.valueOf(book);
      else
         title = null;
   }
   public void setAuthor (String writer)
   {
      if (writer!=null)
         author = String.valueOf(writer);
      else
         author = null;
   }
```

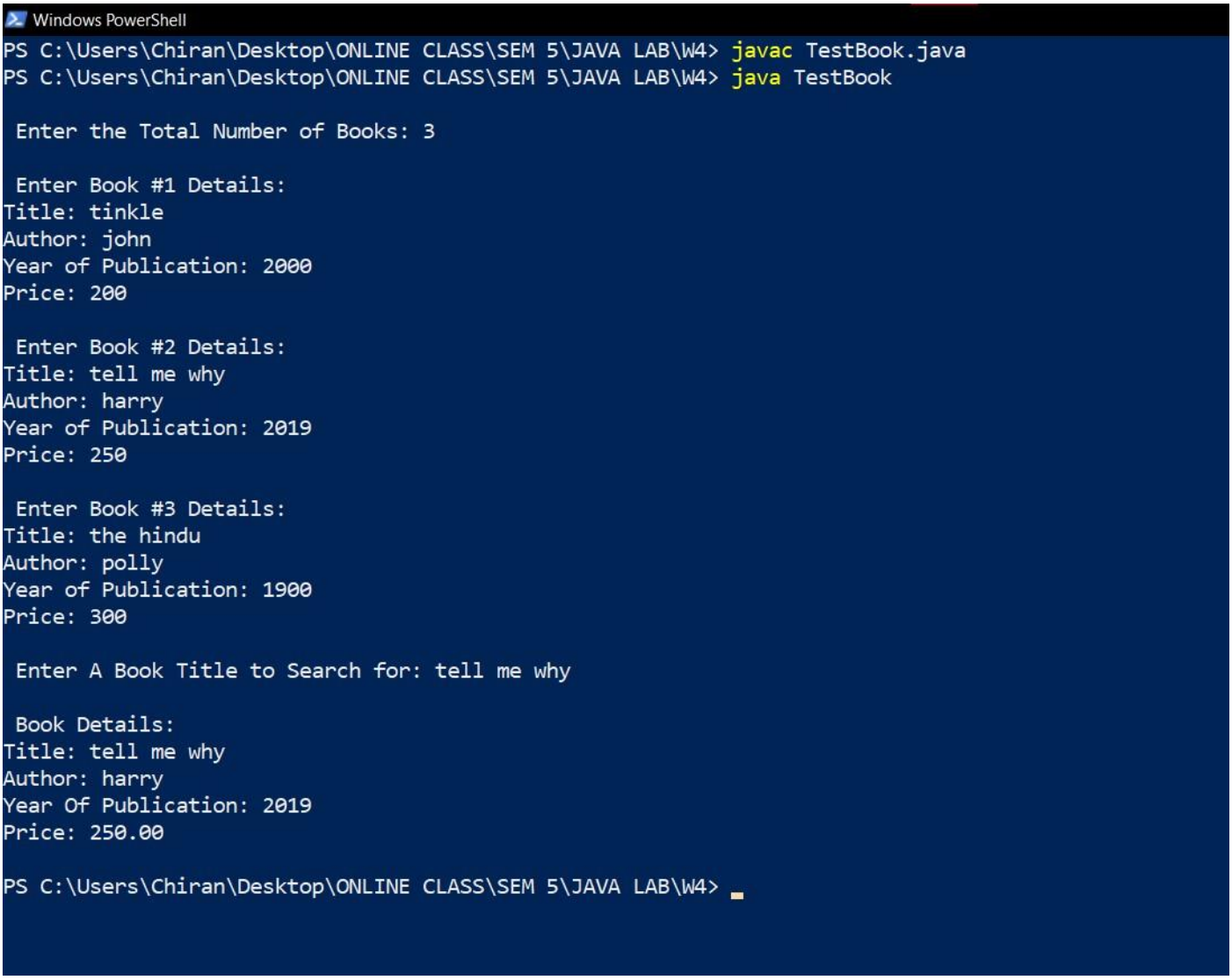
```
   public void setYearOfPublication (int year) {
      if (year>0)
         yearOfPublication = year;
      else
         yearOfPublication = 0;
   }
   public void setPrice (double cost) {
      if (cost>0)
         price = cost;
      else
         price = 0;
   }


   public void display ()
   {
      System.out.println(" Book Details: ");
      System.out.printf("Title: %s \nAuthor: %s \nYear Of Publication: %d \nPrice: %.2f\n \n", title, author, yearOfPub
lication, price);
   }



}
```

TestBook.java

```
import java.util.*;

public class TestBook
{
   public static void main(String[] args)
   {
      Scanner input = new Scanner(System.in);

      int i, n;
      System.out.print("\n Enter the Total Number of Books: ");
      n = input.nextInt();

      Book [] objects = new Book[n];

      for (i=0; i<n; i++)
      {
         input.nextLine();

         String book = new String();
         String writer = new String();
         int year;
         double cost;

         System.out.println("\n Enter Book #" + (i+1) + " Details: ");

         System.out.print("Title: ");
         book = input.nextLine();

         System.out.print("Author: ");
         writer = input.nextLine();

         System.out.print("Year of Publication: ");
         year =  input.nextInt();

         System.out.print("Price: ");
         cost = input.nextDouble();

         objects[i] = new Book(book, writer, year, cost);
      }

      input.nextLine();
```

```
        System.out.print("\n Enter A Book Title to Search for: ");
        String name = input.nextLine();

        //input.nextLine();

        Book b = new Book();
        b = search(objects, name, n);

        if (b==null)
            System.out.println("\n Book with title _________ is not found \n");
        else
        {
            b.display();
        }

        input.close();
    }

    public static Book search (Book lib[], String title, int n)
    {
        int i;
        for (i=0; i<n; i++)
        {
            if ( title.equals(lib[i].title) )
            {
                System.out.println();
                return lib[i];
            }

        }

        return null;
    }


}
```

OUTPUT:


Windows PowerShell
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> javac TestBook.java
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4> java TestBook
Enter the Total Number of Books: 3
Enter Book #1 Details:
Title: tinkle
Author: john
Year of Publication: 2000
Price: 200
Enter Book #2 Details:
Title: tell me why
Author: harry
Year of Publication: 2019
Price: 250
Enter Book #3 Details:
Title: the hindu
Author: polly
Year of Publication: 1900
Price: 300
Enter A Book Title to Search for: tell me why
Book Details:
Title: tell me why
Author: harry
Year Of Publication: 2019
Price: 250.00
PS C:\Users\Chiran\Desktop\ONLINE CLASS\SEM 5\JAVA LAB\W4>

	Marks
Preparatory Exercises	
Observation	
Spot	
Total	