# COMSATS University Islamabad, Lahore Campus
## Department of Computer Science

## Assignment 2 – Semester Fall 2020

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Course Title: | Object Oriented Programming | | | | Course Code: | CSC241 Credit Hours: | 4(3,1) |
| Course Instructor/s: | Ms. Muntaha Iqbal | | | | Programme | BCE | |
| Semester: | 3rd | Section: | A | Batch | FA19-BCE<br>60 Minutes | | |
| Total Marks: | **10**<br>Obtained Marks: | Obtained Marks: | | | Date: | December 15, 2020 | |
| Student's Name: | Hassaan Saleem | | | | Reg. No. | FA19-BCE-A-024 | |

**Important Instruction:**

- Student is himself/herself responsible for successful submission of assignment on CU-Online
- Your submission must include the following in a single pdf file.
  1. Code of all classes
  2. Snapshot of the output of submitted code.
- Copied assignment will get zero credit.
- Deadline: December 20, 2020 at 11:30 PM

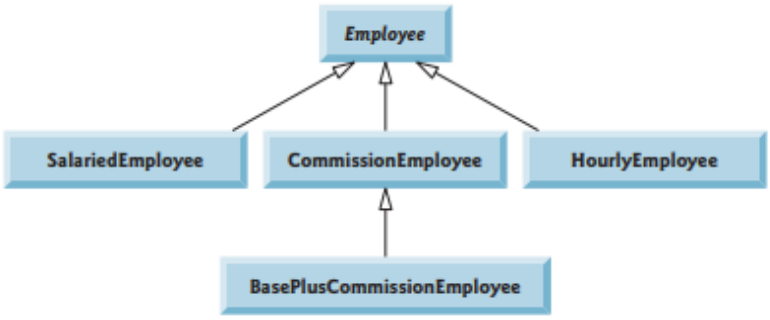
**Question 1:**

**Recall the concept of Inheritance, method overriding and polymorphism and write down the code according to requirements.**

**Learning Outcome: PLO2→CLO2 (C1, C2, C3)**

**Question 1:**

**A company pays its employees on a weekly basis. The employees are of four types: Salaried employees are paid a fixed weekly salary regardless of the number of hours worked, hourly employees are paid by the hour and receive overtime pay for all hours worked in excess of 40 hours, commission employees are paid a percentage of their sales and salaried- commission employees receive a base salary plus a percentage of their sales. For the current pay period, the company has decided to reward salaried-commission employees by adding 10% to their base salaries. The company wants to implement a Java application that performs its payroll calculations polymorphically.**



| | earnings | toString |
|---|---|---|
| Employee | abstract | *firstName lastName*<br>social security number: *SSN* |
| Salaried-Employee | weeklySalary | salaried employee: *firstName lastName*<br>social security number: *SSN*<br>weekly salary: *weeklySalary* |
| Hourly-Employee | if (hours <= 40)<br>  wage * hours<br>else if (hours > 40)<br>{<br>  40 * wage +<br>  ( hours - 40 ) *<br>  wage * 1.5<br>} | hourly employee: *firstName lastName*<br>social security number: *SSN*<br>hourly wage: *wage*; hours worked: *hours* |
| Commission-Employee | commissionRate * grossSales | commission employee: *firstName lastName*<br>social security number: *SSN*<br>gross sales: *grossSales*;<br>commission rate: *commissionRate* |
| BasePlus-Commission-Employee | (commissionRate * grossSales) + baseSalary | base salaried commission employee: *firstName lastName*<br>social security number: *SSN*<br>gross sales: *grossSales*;<br>commission rate: *commissionRate*;<br>base salary: *baseSalary* |

- Modify the above payroll system to include private instance variable birthDate in class Employee. Add *get* methods to class Date. Assume that payroll is processed once per month.
- Include an additional Employee subclass PieceWorker that represents an employee whose pay is based on the number of pieces of merchandise produced. Class PieceWorker should contain private instance variables wage (to store the employee's wage per piece) and pieces (to store the number of pieces produced). Provide a concrete implementation of method earnings in class PieceWorker that calculates the employee's earnings by multiplying the number of pieces produced by the wage per piece. Create an array of Employee variables to store references to the various employee objects. In a loop, For each Employee, display its String representation and calculate the payroll for each Employee (polymorphically), and add a $100.00 bonus to the person's payroll amount if the current month is the one in which the Employee's birthday occurs or an employee object is of type BasePlusCommissionEmployee

# Ans to the Question

# Code:

Date Class:

```
package com.bitspedia.oop.assignment;

public class Date {
    private String birth_date;
    private String receiving_salary_date;

    public Date(String birth_date,String receiving_salary_date)
    {
        this.setBirth_date(birth_date);
        this.setReceiving_salary_date(receiving_salary_date);
    }

    public String getBirth_date() {
        return birth_date;
    }

    public void setBirth_date(String birth_date) {
        this.birth_date = birth_date;
```

```
    }
    public String getReceiving_salary_date() {
        return receiving_salary_date;
    }

    public void setReceiving_salary_date(String receiving_salary_date) {
        this.receiving_salary_date = receiving_salary_date;
    }
}
```

Employee Class:

```
package com.bitspedia.oop.assignment;

public abstract class Employee {

    private String firstname;
    private String lastname;
    private String social_security_number;
    private Date date_of_birth;
```

```
    public Employee(String firstname, String lastname,String
social_security_number) {
        this.firstname = firstname;
        this.lastname = lastname;
         this.social_security_number = social_security_number;
    }

    public String getFirstname() {
        return firstname;
    }

    public void setFirstname(String firstname) {
        this.firstname = firstname;
    }

    public String getLastname() {
        return lastname;
    }

    public void setLastname(String lastname) {
        this.lastname = lastname;
```

```
    }

    public String getSocial_security_number() {
        return social_security_number;
    }

    public void setSocial_security_number(String
social_security_number) {
        this.social_security_number = social_security_number;
    }

    public abstract double earnings();

    @Override
    public String toString() {
        return "Employee{" + "firstname=" + firstname + ", lastname=" +
lastname + ", social_security_number=" + social_security_number + '}';
    }

    public Date getDate_of_birth() {
        return date_of_birth;
```

```
    }
    public void setDate_of_birth(Date date_of_birth) {
        this.date_of_birth = date_of_birth;
    }
}
```

Salaried Employee Class:

```
package com.bitspedia.oop.assignment;

public class Salaried_Employee extends Employee
{
    private double weekly_salary;

    public Salaried_Employee(String firstname, String lastname,String
social_security_number, double weekly_salary) {
        super(firstname, lastname, social_security_number);
        this.weekly_salary = weekly_salary;
    }

    public double getWeekly_salary() {
```

```
        return weekly_salary;
    }

    public void setWeekly_salary(double weekly_salary) {
        this.weekly_salary = weekly_salary;
    }

    @Override
    public double earnings() {

        return weekly_salary;
    }

    @Override
    public String toString() {
        return super.toString() + "Salaried_Employee{" +
"weekly_salary=" + weekly_salary + '}';
    }
}
```

Hourly Employee Class:

```
package com.bitspedia.oop.assignment;

public class Hourly_Employee extends Employee
{
    private double hourly_wage;
    private double hours_worked;

    public Hourly_Employee(String firstname, String lastname, String
social_security_number, double hourly_wage, double hours_worked) {
        super(firstname, lastname, social_security_number);
        this.hourly_wage = hourly_wage;
        this.hours_worked = hours_worked;
    }

    public double getHourly_wage() {
        return hourly_wage;
    }

    public void setHourly_wage(double hourly_wage) {
        this.hourly_wage = hourly_wage;
```

```
}

public double getHours_worked() {
    return hours_worked;
}

public void setHours_worked(double hours_worked) {
    this.hours_worked = hours_worked;
}

@Override
public double earnings()
{
    double amount = 0;

    if(hours_worked > 0 && hours_worked <= 40)
    {
        amount = hourly_wage * hours_worked;
        return amount;
    }
```

```
        if(hours_worked > 40)
        {
            amount = (40 * hourly_wage) + (hours_worked - 40) *
(hourly_wage * 1.5);

            return amount;
        }

        return amount;
    }

    @Override
    public String toString() {
        return super.toString() + "Hourly_Employee{" + "hourly_wage=" +
hourly_wage + ", hours_worked=" + hours_worked + '}';
    }
}
```

Commission Employee Class:

```
package com.bitspedia.oop.assignment;
```

```
public class Comission_Employee extends Employee
{
    private double gross_sales;
    private double comission_rate;

    public Comission_Employee(String firstname, String lastname, String
social_security_number, double gross_sales, double comission_rate) {
        super(firstname, lastname, social_security_number);
        this.gross_sales = gross_sales;
        this.comission_rate = comission_rate;
    }

    public double getGross_sales() {
        return gross_sales;
    }

    public void setGross_sales(double gross_sales) {
        this.gross_sales = gross_sales;
    }
```

```
    public double getComission_rate() {
        return comission_rate;
    }

    public void setComission_rate(double comission_rate) {
        this.comission_rate = comission_rate;
    }


    @Override
    public double earnings()
    {
      return (getGross_sales() * getComission_rate());
    }

    @Override
    public String toString() {
        return super.toString() + "Comission_Employee{" + "gross_sales="
+ gross_sales + ", comission_rate=" + comission_rate + '}';
    }
}
```

Base Plus Commission Employee Class:

```
package com.bitspedia.oop.assignment;



public class BasePlus_Comission_Employee extends
Comission_Employee
{
    private double base_salary;


    public BasePlus_Comission_Employee(String firstname, String
lastname, String social_security_number, double gross_sales, double
comission_rate,double base_salary)
    {
        super(firstname, lastname, social_security_number, gross_sales,
comission_rate);
        this.base_salary = base_salary;
    }


    public double getBase_salary() {
        return base_salary;
```

```
    }

    public void setBase_salary(double base_salary) {
        this.base_salary = base_salary;
    }

    @Override
    public double earnings() {
        double earn;

        earn = ((getComission_rate() * getGross_sales()) +
getBase_salary());

        return earn;
    }

    @Override
    public String toString() {
        return super.toString() + "BasePlus_Comission_Employee{" +
"base_salary=" + base_salary + '}';
    }
```

```
}
```

Piece Worker Class:

```
package com.bitspedia.oop.assignment;

////////////////////////////////////


public class Piece_Worker extends Employee
{
    private double wage; //// employee's wage per piece
    private double pieces; //// number of pieces produced

    public Piece_Worker(String firstname, String lastname,String
social_security_number, double wage, double pieces) {
        super(firstname,lastname,social_security_number);
        this.wage = wage;
        this.pieces = pieces;
    }
```

```
public double getWage() {
    return wage;
}

public void setWage(double wage) {
    this.wage = wage;
}

public double getPieces() {
    return pieces;
}

public void setPieces(double pieces) {
    this.pieces = pieces;
}

@Override
public double earnings()
{
    return (getWage() * getPieces());
}
```

```
    @Override
    public String toString() {
        return super.toString() + "Piece_Worker{" + "wage=" + wage + ", pieces=" + pieces + '}';
    }
}
```

Employee Test Class:

```
package com.bitspedia.oop.assignment;

import java.util.Scanner;

public class EmployeeTest {

    public static void main(String[] args)
    {
        Scanner int_scan = new Scanner(System.in);
        Scanner string_scan = new Scanner(System.in);
```

```
System.out.println("enter the elements you want to store ");
int elements = int_scan.nextInt();

Employee [] employee = new Employee [elements];

for (int i = 0; i < employee.length; i++)
{
   System.out.println( );

   System.out.println("enter 1 for salaried employee // 2 for hourly employee // 3 comission employee // 4 for base plus comission employee // "
         + "enter 5 for piece worker ");

   int choice = int_scan.nextInt();

   System.out.println( );

   System.out.println("enter the birth month of the employee ");
      String birth_month = string_scan.nextLine();
```

```
            System.out.println( );

            System.out.println("enter the salary month of the employee ");
            String salary_month = string_scan.nextLine();

             Date months = new Date(birth_month, salary_month);

        if (choice == 1)
        {
            System.out.println( );

            System.out.println("print information of salaried employee ");
            System.out.println( );

            System.out.println("enter the first name of salaried employee
");
            String firstname = string_scan.nextLine();

            System.out.println( );
```

```
System.out.println("enter the last name of salaried employee
");
String lastname = string_scan.nextLine();

System.out.println( );

System.out.println("enter the  SSN of salaried employee ");
String SSN = string_scan.nextLine();

System.out.println( );

System.out.println("enter the  the weekly salary of salaried
employee ");
double weekly_salary = int_scan.nextDouble();


Salaried_Employee salaried_employee = new
Salaried_Employee(firstname, lastname, SSN, weekly_salary);

salaried_employee.setDate_of_birth(months);

employee [i] = salaried_employee;
```

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

        else if (choice == 2)
        {
            System.out.println( );

             System.out.println("print information of hourly employee ");
            System.out.println( );

            System.out.println("enter the first name of hourly employee ");
            String firstname = string_scan.nextLine();

            System.out.println( );

             System.out.println("enter the last name of hourly employee
");
            String lastname = string_scan.nextLine();

            System.out.println( );
```

```
            System.out.println("enter the  SSN of hourly employee ");
            String SSN = string_scan.nextLine();

            System.out.println( );

            System.out.println("enter the hourly wage of hourly employee
");
            double hourly_wage = int_scan.nextDouble();

            System.out.println( );

            System.out.println("enter the number of hours worked by an
hourly employee ");
            double hours = int_scan.nextDouble();

            Hourly_Employee hourly_employee = new
Hourly_Employee(firstname, lastname, SSN, hourly_wage, hours);

             hourly_employee.setDate_of_birth(months);

            employee [i] = hourly_employee;
```

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

        else if(choice == 3)
        {
            System.out.println( );

            System.out.println("print information of comission employee
");
            System.out.println( );

            System.out.println("enter the first name of comission
employee ");
            String firstname = string_scan.nextLine();

            System.out.println( );

             System.out.println("enter the last name of comission
employee ");
            String lastname = string_scan.nextLine();
```

```
System.out.println( );

System.out.println("enter the  SSN of comission employee ");
String SSN = string_scan.nextLine();

System.out.println( );

System.out.println("enter the gross sales of comission employee ");
double gross_sales = int_scan.nextDouble();

System.out.println( );

System.out.println("enter the comission rate of an comission employee ");
double rate = int_scan.nextDouble();

System.out.println( );

Comission_Employee comission_employee = new Comission_Employee(firstname, lastname, SSN, gross_sales, rate);
```

```
            comission_employee.setDate_of_birth(months);

            employee [i] = comission_employee;

            System.out.println( );

        }

        else if(choice == 4)
        {
            System.out.println( );

            System.out.println("print information of base plus comission
employee ");
            System.out.println( );

            System.out.println("enter the first name of base plus comission
employee ");
            String firstname = string_scan.nextLine();

            System.out.println( );
```

```
System.out.println("enter the last name of base plus comission employee ");
String lastname = string_scan.nextLine();

System.out.println( );

System.out.println("enter the  SSN of base plus comission employee ");
String SSN = string_scan.nextLine();

System.out.println( );

System.out.println("enter the gross sales of base plus comission employee ");
double gross_sales = int_scan.nextDouble();

System.out.println( );

System.out.println("enter the comission rate of a base plus comission employee ");
double comission_rate = int_scan.nextDouble();
```

```
            System.out.println( );

            System.out.println("enter the base salary of base plus
comission employee ");
            double base_salary = int_scan.nextDouble();

          BasePlus_Comission_Employee
base_plus_comission_employee = new
BasePlus_Comission_Employee(firstname, lastname, SSN, gross_sales,

comission_rate, base_salary);

             base_plus_comission_employee.setDate_of_birth(months);

            employee [i] = base_plus_comission_employee;

            System.out.println( );

        }

        else if(choice == 5)
```

```
        {
            System.out.println( );
           System.out.println("print information of piece worker
employee ");
            System.out.println( );

            System.out.println("enter the first name of piece worker
employee ");
            String firstname = string_scan.nextLine();

            System.out.println( );

             System.out.println("enter the last name of base piece worker
employee ");
            String lastname = string_scan.nextLine();

            System.out.println( );

            System.out.println("enter the  SSN of piece worker employee
");
            String SSN = string_scan.nextLine();
```

```
System.out.println( );

System.out.println("enter the wages of piece worker employee
");
double wages = int_scan.nextDouble();

System.out.println( );

System.out.println("enter the number of pieces produced by a
piece worker employee ");
double pieces_number = int_scan.nextDouble();

System.out.println( );

Piece_Worker piece_worker = new Piece_Worker(firstname,
lastname, SSN, wages, pieces_number);

 piece_worker.setDate_of_birth(months);

employee [i] = piece_worker;
```

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

     for (Employee employees_s : employee)
    {
        if
(employees_s.getDate_of_birth().getBirth_date().equals(employees_s.ge
tDate_of_birth().getReceiving_salary_date()))
        {
            System.out.println( );
            System.out.println(employees_s.toString());
            System.out.println( );
            System.out.println("pay roll of the employee is " +
(employees_s.earnings() + 100));
            System.out.println( );
        }

        else if (employees_s instanceof BasePlus_Comission_Employee)
        {
            System.out.println( );
            System.out.println(employees_s.toString());
```

```
            System.out.println( );
            System.out.println("total earnings of the base plus comission employee are " + (employees_s.earnings() + 100));
            System.out.println( );
        }

        else
        {
            System.out.println( );
            System.out.println(employees_s.toString());
            System.out.println( );
            System.out.println("total earnings of the employee are " + employees_s.earnings());
            System.out.println( );
        }
      }

    }
  }
```

//////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

//////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

Output:

run:

enter the elements you want to store

2

enter 1 for salaried employee // 2 for hourly employee // 3 comission employee // 4 for base plus comission employee // enter 5 for piece worker

1

enter the birth month of the employee

january

enter the salary month of the employee

february

print information of salaried employee

enter the first name of salaried employee

hassaan

enter the last name of salaried employee

saleem

enter the  SSN of salaried employee

1234

enter the  the weekly salary of salaried employee

3400

enter 1 for salaried employee // 2 for hourly employee // 3 comission employee // 4 for base plus comission employee // enter 5 for piece worker

3

enter the birth month of the employee

march

enter the salary month of the employee

march

print information of comission employee

enter the first name of comission employee

qasim

enter the last name of comission employee

shah

enter the  SSN of comission employee

345

enter the gross sales of comission employee

34

enter the comission rate of an comission employee

2

Employee{firstname=hassaan, lastname=saleem, social_security_number=1234}Salaried_Employee{weekly_salary=3400.0}

total earnings of the employee are 3400.0

Employee{firstname=qasim, lastname=shah, social_security_number=345}Comission_Employee{gross_sales=34.0, comission_rate=2.0}

pay roll of the employee is 168.0

BUILD SUCCESSFUL (total time: 44 seconds)

Paste screen shot 1 of the same output:

Output - oop new assignment (run) #6

```
run:
enter the elements you want to store
2

enter 1 for salaried employee // 2 for hourly employee // 3 comission employee // 4 for base plus comission employee // enter 5 for piece worker
1

enter the birth month of the employee
january

enter the salary month of the employee
february

print information of salaried employee

enter the first name of salaried employee
hassaan

enter the last name of salaried employee
saleem

enter the  SSN of salaried employee
1234

enter the  the weekly salary of salaried employee
3400


enter 1 for salaried employee // 2 for hourly employee // 3 comission employee // 4 for base plus comission employee // enter 5 for piece worker
3

enter the birth month of the employee
march

enter the salary month of the employee
march

print information of comission employee

enter the first name of comission employee
qasim

enter the last name of comission employee
shah

enter the  SSN of comission employee
345

enter the gross sales of comission employee
34
```

Paste screen shot 2 of the same output:

```
enter the gross sales of comission employee
34

enter the comission rate of an comission employee
2



Employee{firstname=hassaan, lastname=saleem, social_security_number=1234}Salaried_Employee{weekly_salary=3400.0}

total earnings of the employee are 3400.0


Employee{firstname=qasim, lastname=shah, social_security_number=345}Comission_Employee{gross_sales=34.0, comission_rate=2.0}

pay roll of the employee is 168.0

BUILD SUCCESSFUL (total time: 44 seconds)
```

The end of oop assignment