# Assignment 4

Problem Description:

Define a class named Time for encapsulating a time. The class contains the following:

1. A data field of the long time that stores the elapsed time since midnight, Jan 1, 1970.
2. A no-arg constructor that constructs a Time for the current time.
3. A constructor with the specified hour, minute, and second to create a Time.
4. A constructor with the specified elapsed time since midnight, Jan 1, 1970.
5. The getHour() method that returns the current hour in the range 0-23.
6. The getMinute() method that returns the current minute in the range 0-59.
7. The getSecond() method that returns the current second in the range 0-59.
8. The getSeconds() method that returns the elapsed total seconds.
9. The toString() method that returns a string such as "1 hour 2 minutes 1 second" and "14 hours 21 minutes 1 second".
10. Implement the Comparable<Time> interface to compare this Time with another one based on their elapse seconds. The compareTo method returns the difference between this object’s elapse seconds and the another’s.
11. Implement the Cloneable interface to clone a Time object.

Write a test program that produces the following sample run:

```
<Sample Run>
Enter time1 (hour minute second): 331 34 674 <Enter>
19 hours 45 minutes 14 seconds
Elapsed seconds in time1: 1194314
Enter time2 (elapsed time): 93889345 <Enter>
16 hours 22 minutes 25 seconds
Elapsed seconds in time2: 93889345
time1.compareTo(time2)? -92695031
time3 is created as a clone of time1
time1.compareTo(time3)? 0
<End Sample Run>
```

```
<Sample Run>
Enter time1 (hour minute second): 1 2 3 <Enter>
1 hour 2 minutes 3 seconds
Elapsed seconds in time1: 3723
Enter time2 (elapsed time): 193032 <Enter>
5 hours 37 minutes 12 seconds
Elapsed seconds in time2: 193032
time1.compareTo(time2)? -189309
time3 is created as a clone of time1
```

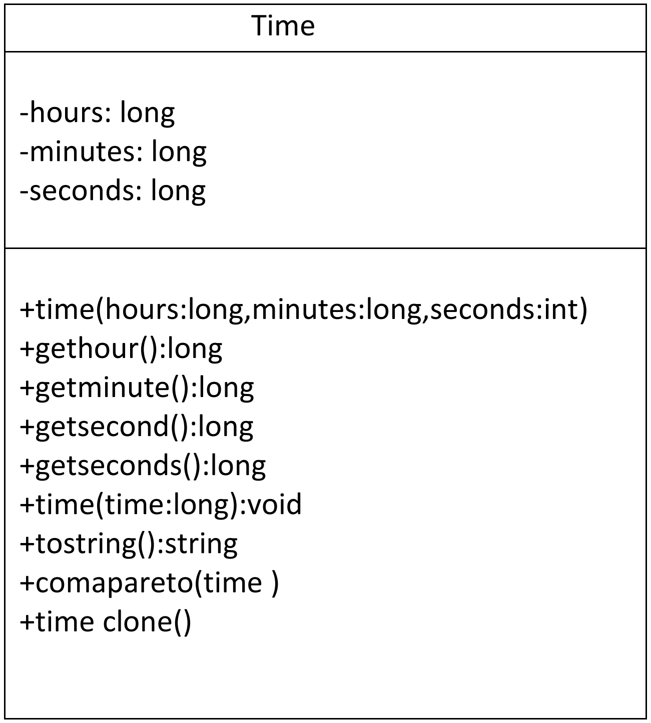
```
time1.compareTo(time3)? 0
<End Sample Run>
```

## **Analysis:**

- In the given problem we have to create class named time for encapsulating time.
  This class contains
  1. A data field of long time that stores the elapsed time since midnight,Jan 1, 1970.
  2. No argument constructor that constructs time for current time.
  3. Constructor with specified hour, minute and seconds to create a time.
  4. Constructor with specified elapsed time since midnight jan 1,1970.
  5. getHour() method that returns the current hour in the range 0-23
  6. getMinute() method that returns the current minute in range 0-59
  7. getSecond () method that returns the current second in range 0-59
  8. getSeconds () returns elapsed seconds.
  9. The toString method that return a string
  10. Implement the comparable<time> interface to compare this tme with another one based on their elapse seconds.
  11. The compare to method must return the difference between this objects elapsed seconds and the another’s
  12. Also implement the cloneable interface to clone the time object.
- We have to put the sample inputs from the user and calculate the elapsed time and display results.

## Design:

### UML Diagram for the problem



Time

-hours: long
-minutes: long
-seconds: long

+time(hours:long,minutes:long,seconds:int)
+gethour():long
+getminute():long
+getsecond():long
+getseconds():long
+time(time:long):void
+tostring():string
+comapareto(time )
+time clone()

## Coding:

```java
/* Basavraj Jaliminche
 * id- 8800149
 * Assignment 4
 * PROG8580-Computer Programming
 */

package Assignment4;

//here time class implements comparable and clonable
public class time implements Comparable<time>, Cloneable {
        private long t;

        public time() {
                t = System.currentTimeMillis();
        }

        // constructor spacified with hour,minute,seconds
        public time(long hr, long min, long sec) {
                t = ((((hr * 60) + min) * 60) + sec) * 1000;

        }

        public int getHour() {
                // hours in the between 0 to 23.
                return (int) (t / (1000 * 60 * 60)) % 24;
        }

        public int getMinute() {
                // minutes between 0 to 59
                return (int) (t / (1000 * 60)) % 60;
        }

        public int getSecond() {
                // seconds between 0 to 59.
                return (int) (t / 1000) % 60;
        }

        public int getSeconds() {
                // returns the elapsed time seconds.
                return (int) (t / 1000);
        }

        public time(long time) {
                t = time * 1000;
        }
        @Override
        public String toString() {
                return String.format("%d hours %d minutes %d seconds", getHour(), getMinute(), getSecond());
        }

        @Override
        public int compareTo(time timeCompare) {
                return (int) (this.getSeconds() - timeCompare.getSeconds());
        }

        // time clone throws exception
        public time Clone() throws CloneNotSupportedException {
                return (time) super.clone();
        }

}

/* Basavraj Jaliminche
 * id- 8800149
 * Assignment 4
 * PROG8580-Computer Programming
 */

package Assignment4;

import java.util.Scanner;

public class encasptime {

        public static void main(String[] args) throws CloneNotSupportedException {

                // scanner class
                Scanner sc = new Scanner(System.in);

                // defining variables
                int hrs, mins, secs;

                // Taking input from the user

                System.out.print("<sample run>\n");
                System.out.print("Enter time1 (hour minute second): ");

                hrs = sc.nextInt();
                mins = sc.nextInt();
                secs = sc.nextInt();

                time Time1 = new time(hrs, mins, secs);

                // for taking output used tostring method
        System.out.println(Time1.toString());

        System.out.println("Elapsed seonds in Time 1: " + Time1.getSeconds());

        System.out.println("Enter Time 2 (Elapsed Time): ");

        long mills = sc.nextInt();

        time Time2 = new time(mills);

        System.out.println(Time2);

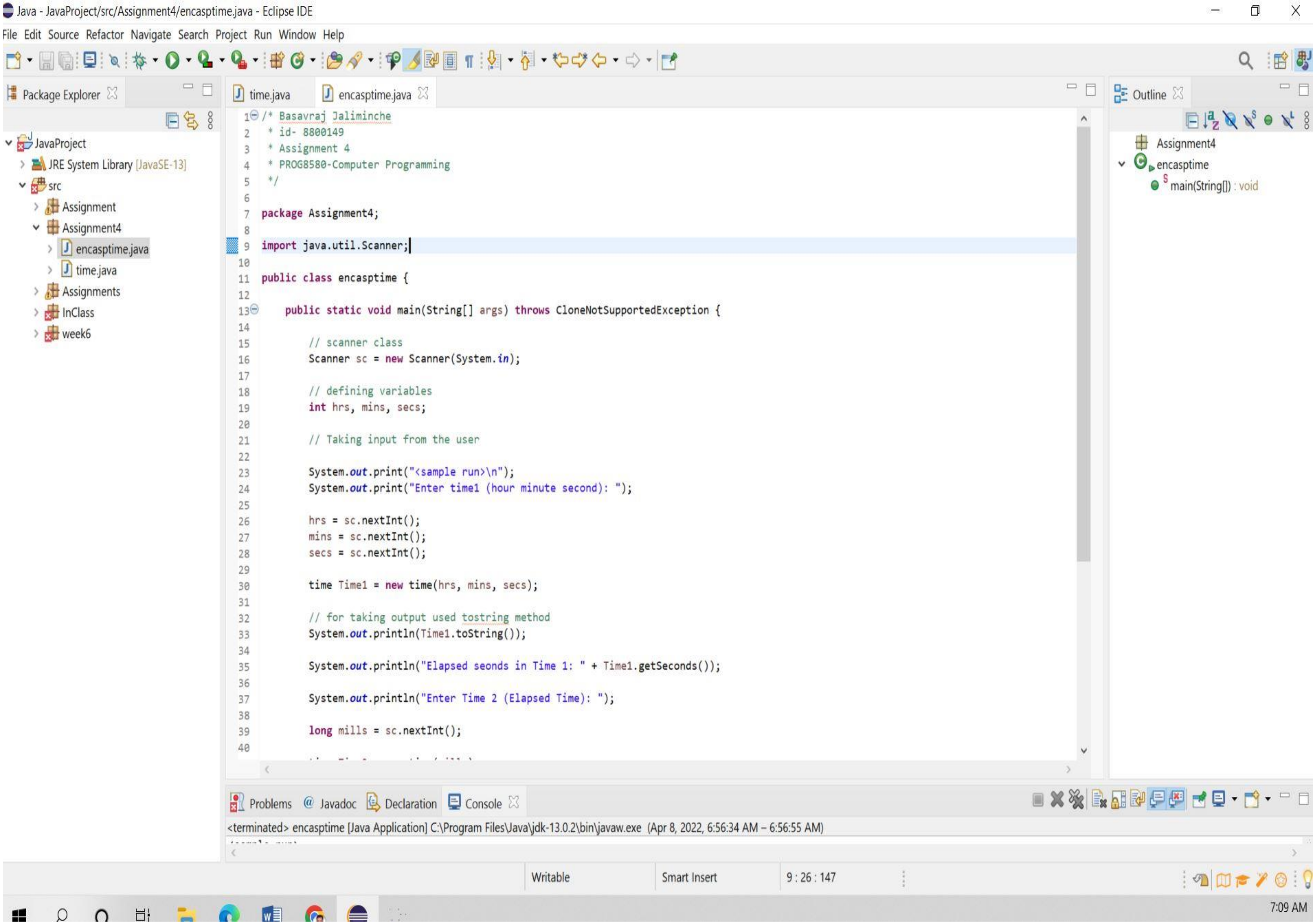
        System.out.println("Elapsed seconds in Time 2: " + Time2.getSeconds());

        System.out.println("Time 1.compareTo(Time 2)? " + Time1.compareTo(Time2));

        time T3 = Time1.Clone();

        System.out.println("Time 3 is created as a clone of Time 1 Time1.compareTo(Time 3)? " + Time1.compareTo(T3));
        System.out.print("<End Saple Run>");
        sc.close();
    }

}
```



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        Scanner sc = new Scanner(System.in);

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        int hrs, mins, secs;

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        System.out.print("<sample run>\n");
        System.out.print("Enter time1 (hour minute second): ");

        hrs = sc.nextInt();
        mins = sc.nextInt();
        secs = sc.nextInt();

        time Time1 = new time(hrs, mins, secs);

        // for taking output used tostring method
        System.out.println(Time1.toString());

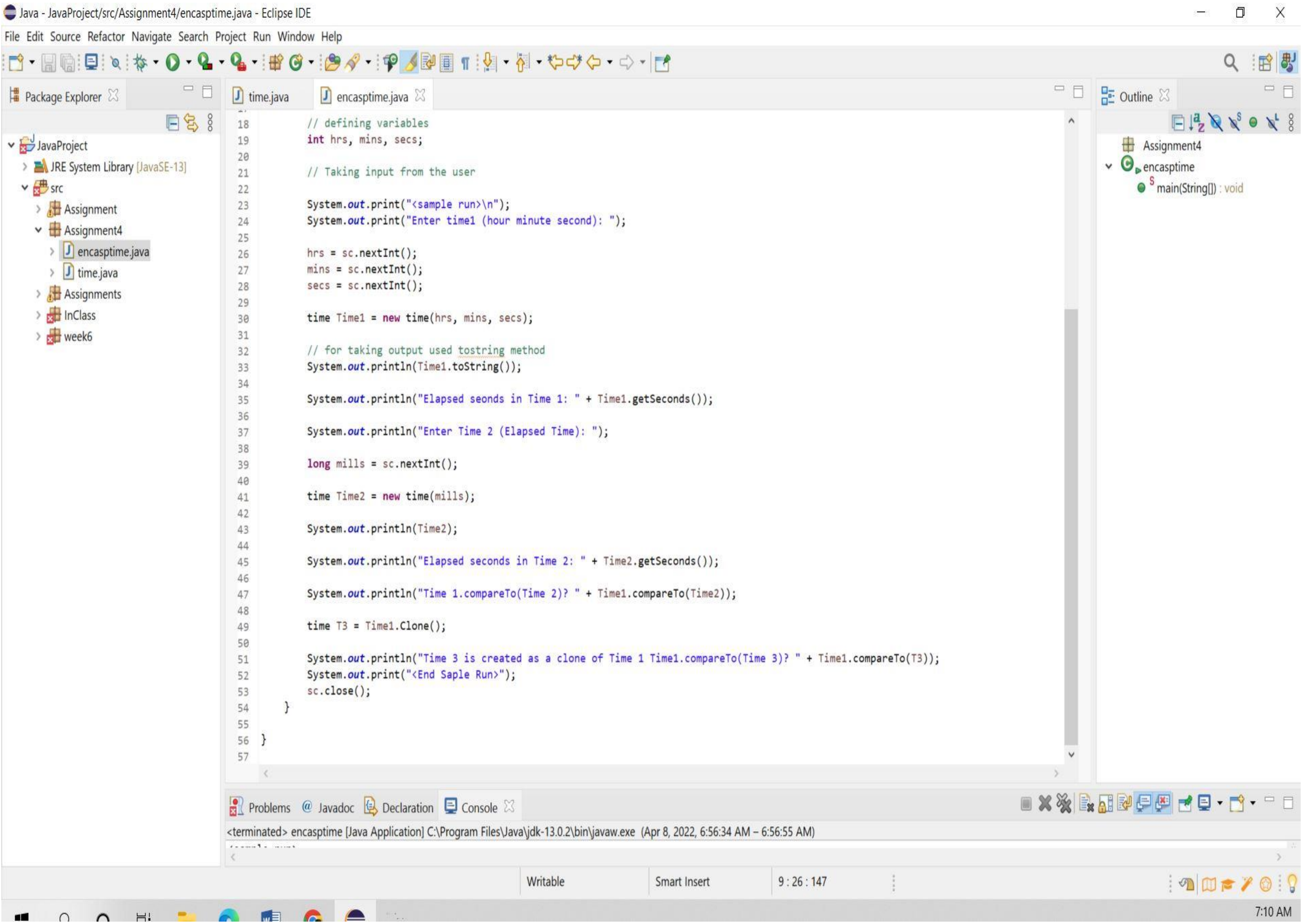
        System.out.println("Elapsed seonds in Time 1: " + Time1.getSeconds());

        System.out.println("Enter Time 2 (Elapsed Time): ");

        long mills = sc.nextInt();

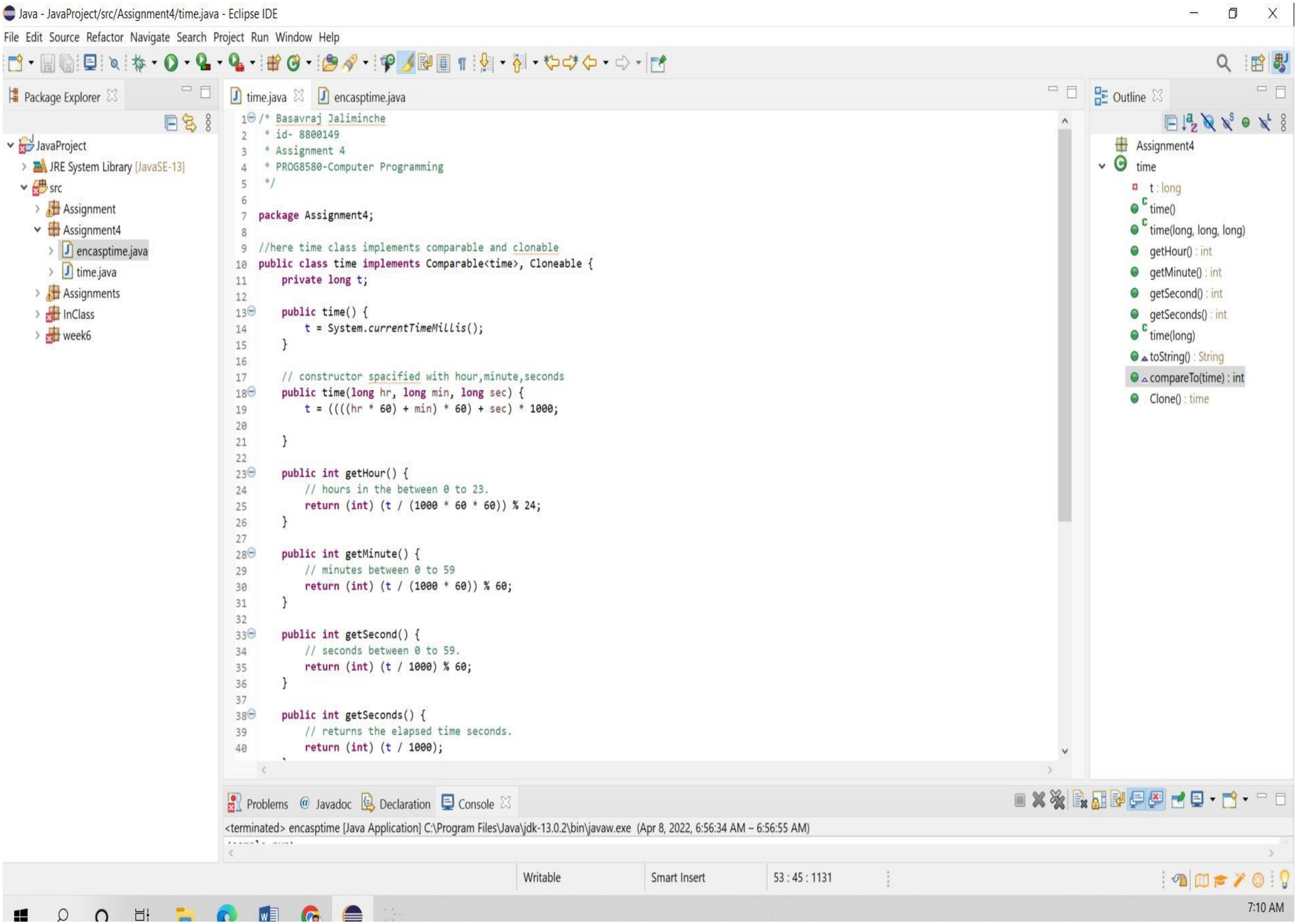
```

```
<terminated> encasptime [Java Application] C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe  (Apr 8, 2022, 6:56:34 AM – 6:56:55 AM)
```



```java
        // defining variables
        int hrs, mins, secs;

        // Taking input from the user

        System.out.print("<sample run>\n");
        System.out.print("Enter time1 (hour minute second): ");

        hrs = sc.nextInt();
        mins = sc.nextInt();
        secs = sc.nextInt();

        time Time1 = new time(hrs, mins, secs);

        // for taking output used tostring method
        System.out.println(Time1.toString());

        System.out.println("Elapsed seonds in Time 1: " + Time1.getSeconds());

        System.out.println("Enter Time 2 (Elapsed Time): ");

        long mills = sc.nextInt();

        time Time2 = new time(mills);

        System.out.println(Time2);

        System.out.println("Elapsed seconds in Time 2: " + Time2.getSeconds());

        System.out.println("Time 1.compareTo(Time 2)? " + Time1.compareTo(Time2));

        time T3 = Time1.Clone();

        System.out.println("Time 3 is created as a clone of Time 1 Time1.compareTo(Time 3)? " + Time1.compareTo(T3));
        System.out.print("<End Saple Run>");
        sc.close();
    }

}

```

```
<terminated> encasptime [Java Application] C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe (Apr 8, 2022, 6:56:34 AM – 6:56:55 AM)
```



```java
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 * Assignment 4
 * PROG8580-Computer Programming
 */

package Assignment4;

//here time class implements comparable and clonable
public class time implements Comparable<time>, Cloneable {
    private long t;

    public time() {
        t = System.currentTimeMillis();
    }

    // constructor spacified with hour,minute,seconds
    public time(long hr, long min, long sec) {
        t = ((((hr * 60) + min) * 60) + sec) * 1000;

    }

    public int getHour() {
        // hours in the between 0 to 23.
        return (int) (t / (1000 * 60 * 60)) % 24;
    }

    public int getMinute() {
        // minutes between 0 to 59
        return (int) (t / (1000 * 60)) % 60;
    }

    public int getSecond() {
        // seconds between 0 to 59.
        return (int) (t / 1000) % 60;
    }

    public int getSeconds() {
        // returns the elapsed time seconds.
        return (int) (t / 1000);
```
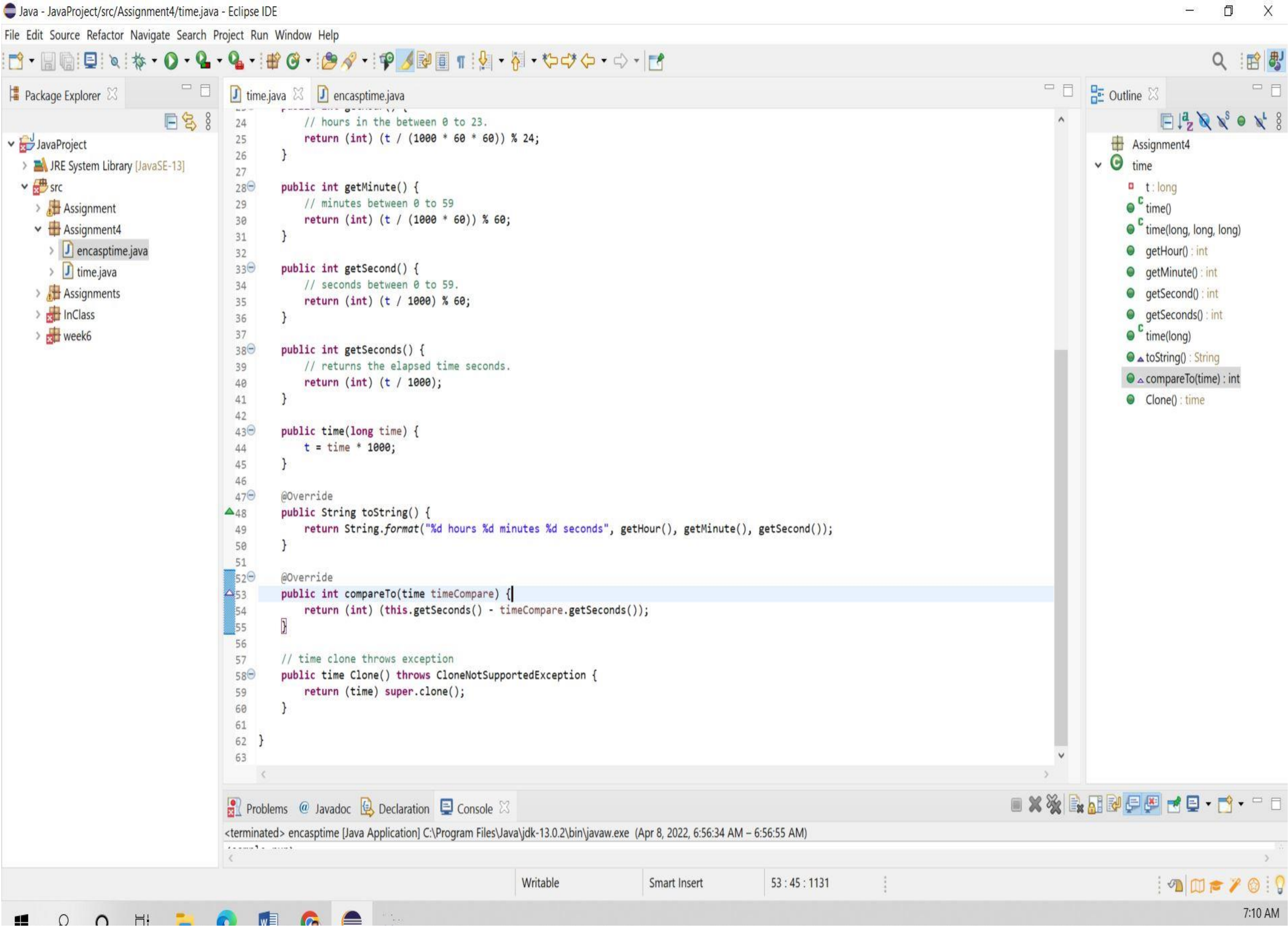

```
<terminated> encasptime [Java Application] C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe (Apr 8, 2022, 6:56:34 AM – 6:56:55 AM)
```

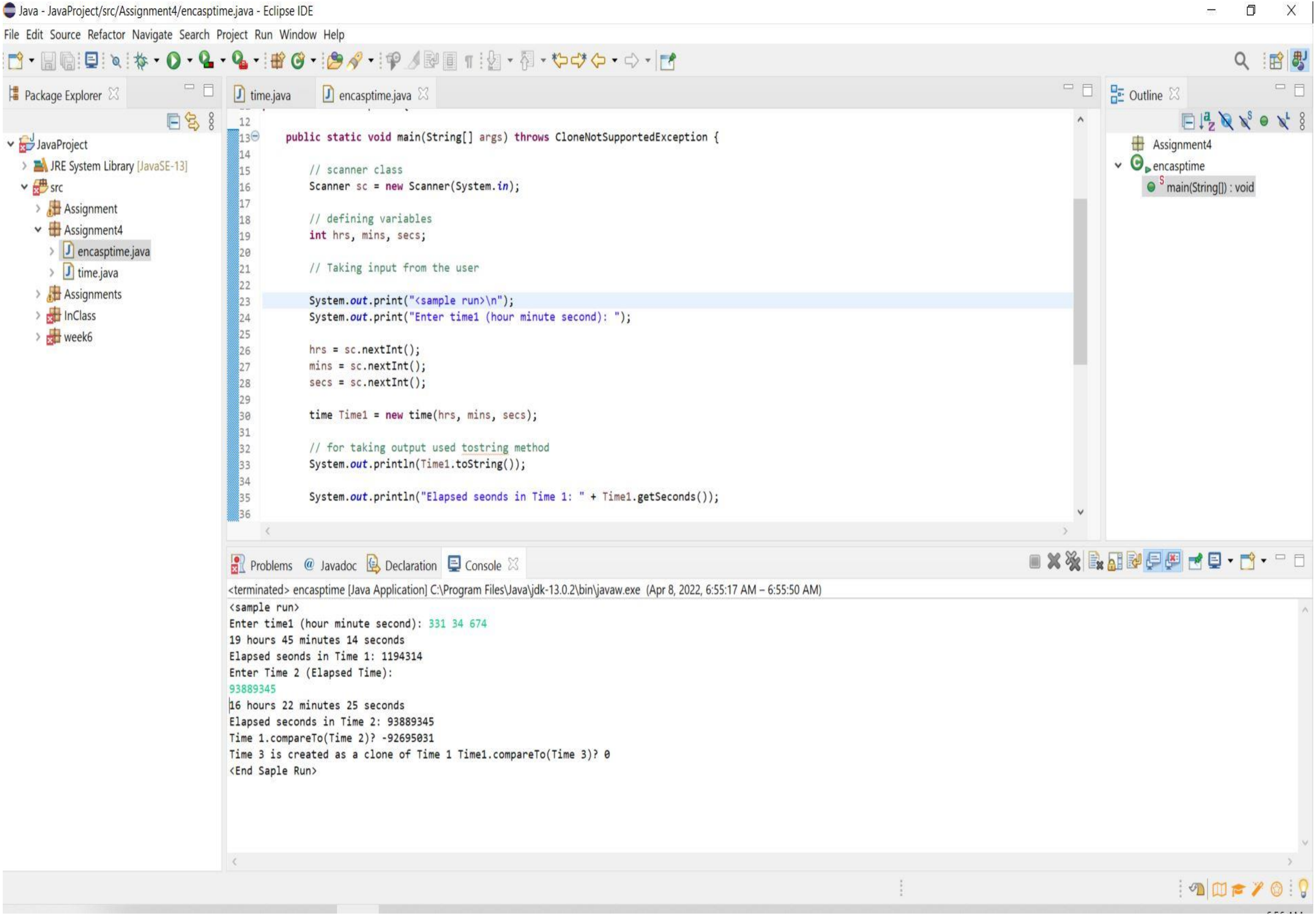


```
        // hours in the between 0 to 23.
        return (int) (t / (1000 * 60 * 60)) % 24;
    }

    public int getMinute() {
        // minutes between 0 to 59
        return (int) (t / (1000 * 60)) % 60;
    }

    public int getSecond() {
        // seconds between 0 to 59.
        return (int) (t / 1000) % 60;
    }

    public int getSeconds() {
        // returns the elapsed time seconds.
        return (int) (t / 1000);
    }

    public time(long time) {
        t = time * 1000;
    }

    @Override
    public String toString() {
        return String.format("%d hours %d minutes %d seconds", getHour(), getMinute(), getSecond());
    }

    @Override
    public int compareTo(time timeCompare) {
        return (int) (this.getSeconds() - timeCompare.getSeconds());
    }

    // time clone throws exception
    public time Clone() throws CloneNotSupportedException {
        return (time) super.clone();
    }

}
```

```
<terminated> encasptime [Java Application] C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe  (Apr 8, 2022, 6:56:34 AM – 6:56:55 AM)
```

# Testing:

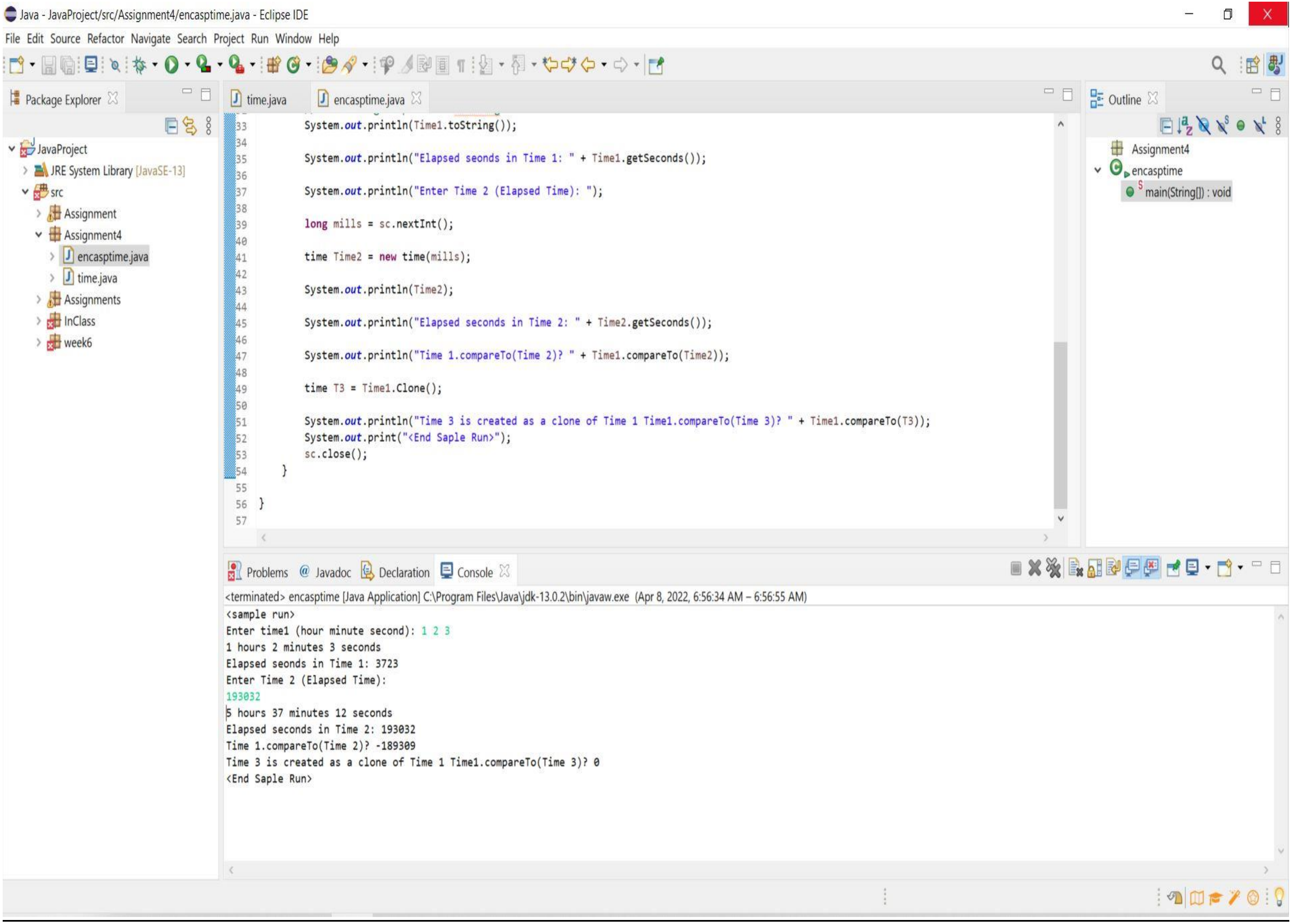
Test 1:



```
    public static void main(String[] args) throws CloneNotSupportedException {

        // scanner class
        Scanner sc = new Scanner(System.in);

        // defining variables
        int hrs, mins, secs;

        // Taking input from the user

        System.out.print("<sample run>\n");
        System.out.print("Enter time1 (hour minute second): ");

        hrs = sc.nextInt();
        mins = sc.nextInt();
        secs = sc.nextInt();

        time Time1 = new time(hrs, mins, secs);

        // for taking output used tostring method
        System.out.println(Time1.toString());

        System.out.println("Elapsed seonds in Time 1: " + Time1.getSeconds());

```

```
<terminated> encasptime [Java Application] C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe (Apr 8, 2022, 6:55:17 AM – 6:55:50 AM)
<sample run>
Enter time1 (hour minute second): 331 34 674
19 hours 45 minutes 14 seconds
Elapsed seonds in Time 1: 1194314
Enter Time 2 (Elapsed Time):
93889345
16 hours 22 minutes 25 seconds
Elapsed seconds in Time 2: 93889345
Time 1.compareTo(Time 2)? -92695031
Time 3 is created as a clone of Time 1 Time1.compareTo(Time 3)? 0
<End Saple Run>
```

Test2:



```
        System.out.println(Time1.toString());

        System.out.println("Elapsed seonds in Time 1: " + Time1.getSeconds());

        System.out.println("Enter Time 2 (Elapsed Time): ");

        long mills = sc.nextInt();

        time Time2 = new time(mills);

        System.out.println(Time2);

        System.out.println("Elapsed seconds in Time 2: " + Time2.getSeconds());

        System.out.println("Time 1.compareTo(Time 2)? " + Time1.compareTo(Time2));

        time T3 = Time1.Clone();

        System.out.println("Time 3 is created as a clone of Time 1 Time1.compareTo(Time 3)? " + Time1.compareTo(T3));
        System.out.print("<End Saple Run>");
        sc.close();
    }

}

```

```
<terminated> encasptime [Java Application] C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe  (Apr 8, 2022, 6:56:34 AM – 6:56:55 AM)
<sample run>
Enter time1 (hour minute second): 1 2 3
1 hours 2 minutes 3 seconds
Elapsed seonds in Time 1: 3723
Enter Time 2 (Elapsed Time):
193032
5 hours 37 minutes 12 seconds
Elapsed seconds in Time 2: 193032
Time 1.compareTo(Time 2)? -189309
Time 3 is created as a clone of Time 1 Time1.compareTo(Time 3)? 0
<End Saple Run>
```