Ahsanullah University of Science and Technology			
Course Title: Object Oriented Programming Lab		**Course No: CSE1206**	
Time: 50 Minutes	**Lab Final Exam (Spring 2019)**	**Set: A**	**Total Marks: 20**

ID:	**Lab Section:**	**Date: 10 October 2019**

1. Write the output of the following code in your answer script? Marks: 3

Code

```
package labfinal;
public class StringSizeNotValidException extends RuntimeException{

    public StringSizeNotValidException(String message) {
        super(message);
    }
}
package labfinal;
public class LabFinal {

    public static void main(String[ ] args) {

        String str = new String("Java Lab");
        str.concat(" Final");
        str = str + " Exam";
        System.out.println(str);

        String words[ ] = str.split(" ");

        try {
            if (words.length < 4) {
                throw new StringSizeNotValidException("String Length too small");
            } else if (words.length > 4) {
                throw new StringSizeNotValidException("String Length too big");
            }
            else
                System.out.println("String length okay");

        } catch (StringSizeNotValidException ex) {
            System.out.println(ex);
        } finally {
            System.out.println(str.substring(5, 13));
        }
    }
}
```

2. Write the following codes in your answer sheet. **Marks: 12**

Researchers in NASA receive signal waves from the Mars Rover on Mars with different information. They receive waves embedded with perfect numbers. A perfect number is a positive integer that is equal to the sum of its positive divisors excluding the number itself.

For example, 28 is a perfect number because 28 is divisible by 1, 2, 4, 7, 14 and 28 and the sum of these values are: 1 + 2 + 4 + 7 + 14 = 28

Now you are asked to develop a program which will be used to help the scientists to receive the signal waves.

a. Create a user defined <u>checked</u> exception named NotPerfectNumberException and override the constructor which takes a String as parameter.	**2**

Now you have to develop a decodeWave() method which will check if the number is a perfect number or not. If not then will give NotPerfectNumberException with the message "Invalid Signal Wave".

b. Create an interface called Wave which has a void method decodeWave()	**1**
c. Create an abstract class called Machine which implements Wave. This Machine class has a private integer variable named value. Write the getter setter methods for this variable. No need to write the constructor. No need to override the method here.	**2**
d. Create a class named Transceiver which inherits the Machine class. Here you will have to override the decodeWave() method and do the checking for perfect number. Use the getValue() method from Machine class as the value for perfect number check. <u>Do not handle the exception in this method.</u>	**4**
e. Now create a class named Researcher and create object of Transceiver, assign a number to the "value" variable using the setter method and then call the decodeWave() method. <u>You must handle the exception here.</u>	**3**

3. Write the following codes in your answer sheet. **Marks: 5**

Suppose the Researchers have received a number P to from the Rover and in return sent a number Q. Now if both P and Q are perfect numbers then the transmission is successful. So they decided to write a multithreaded program to check if both numbers are perfect or not. After the check is complete print if transmission is successful or not. <u>This print cannot occur before the checks are complete</u>.

Now implement this scenario.