UNIVERSITY of WINDSOR
ONTARIO CANADA
School of Computer Science

0360-212
Object-oriented programming using JAVA

[redacted]
Midterm examination 1

Student information

Last name _____ **First name** _____

Student ID# _____ **Lecture section** ___ **Lab section** ___

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iv) A candidate must not write on any paper, other than that in the answer book, and must keep all papers on the desk.

Only a copy of a textbook on Java and your printed class notes.
No computers allowed.
All answers must be given in this booklet.

Part I	Part II	Part III	Part IV	Total
/10	/20	/16	/54	/100

Part I True/False 10 marks

For this part, clearly indicate if each assertion is TRUE or FALSE. You must write "TRUE" or "FALSE", NOT "T" or "F".

1. All variables must be given a type when they are declared.

   Answer: TRUE

2. The size of a one-dimension array must be fixed before a variable referring to the array can be declared.

   Answer: FALSE

3. The length of a string cannot be zero.

   Answer: FALSE

4. Every reference variable referring to an object must have been used together with the operator "new" in a statement to create the object at least once.

   Answer: FALSE

5. Every statement in a Java program must end with a semi-colon, with the only exception of the last statement in the program.

   Answer: FALSE

6. Every class defined in Java programs must have a static main method.

   Answer: FALSE

7. Every method defined in a class must indicate its return type.

   Answer: FALSE

8. Overloaded methods cannot have the same return type.

   Answer: FALSE

9. All elements of an array must have the same data type.

   Answer: TRUE

10. When an object is passed to a method as an argument, it is in fact an exact copy of the object is passed to the method.
    Answer: FALSE

Part II Multiple Choice Questions 20 marks

For this part, please note that each question below may have multiple answers.
Partially correct answer is given marks proportionally.
If your answer has one wrong choice, no mark.

1. Which of the following situation occurs when we try to compile and run **MyApplication**.

```
public class MyApplication{

    public int sum(int x, int y){
        return x+y;
}

public void main(String args[]){
        int x = 5;
        int y = 6;
        System.out.println("x+y="+sum(x,y));
}
}
```

a) A compile-time error.
b) A Run-time error.
c) The program runs and outputs: x+y=11.
d) None of the above.

Your answer: d

2. Identify non-primitive data types in the following declarations:

a) 'b'
b) "Hello"
c) 1.24
d) true

Your answer: b

3. Which of the following statements are true
   (1) A series of statements written to perform a particular task is called "procedure" in Java.
   (2) The return type for a method can be any Java type, including void.
   (3) An important principle of object-oriented programming is implementation hiding.
   (4) In Java, the name of an array is a reference to the array.

   a) None
   b) (1), (2), and (3).
   c) (2), (3) and (4).
   d) All

Your answer: c

4. What will happen if we try to compile and run the following program:

```
public class MyClass  {
    public static void main(String args[]) {

         System.out.println("In first main()");
     }
     public static void  main(char args[]) {

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

   a) Code will not compile successfully and will give "Duplicate main() method declaration" error.
   b) Code will compile successfully but will give a runtime error.
   c) Code will compile successfully and will print "In first main()" (without quotes).
   d) Code will compile successfully and will print "a" (without quotes).

Your answer: c

5. What will be the outcome of executing the following code.

```
public class Test  {
      static int total = 10;
      int anumber=0;

      public static void main (String args []) {
           int anumber=0;
           System.out.print("In Test");
           anumber = total;
           if (anumber > 5)
                 System.out.println("Result is " total+anumber);
     }
}
```

   a) The class will not compile successfully.
   b) The class compiles successfully but produce a runtime error.
   c) The output is 1 line :
      In Test Result is 20
   d) The output is 2 lines
      In Test
      Result is 20
   e) None.

Your answer: a

6. Which of the following is correct

   a) String temp [] = new String {"j" "a" "z"};
   b) String temp = {"a", "b", "c"};
   c) String temp [] = { "j " " b" "c"};
   d) String temp [] = {"a", "b", "c"};

Your answer: d

7. What will be the outcome of compiling and running following code.

```
public class Test {
   static int age;

   public static void main (String args []) {
      age = age + 1;
      System.out.println("The age is " + age);
   }
}
```

a) Compiles successfully and runs with no output.
b) Compiles successfully and runs printing out :
   The age is 1
c) Compiles successfully but generates a runtime error.
d) Does not compile.
e) Compiles but generates a compile time error.

Your answer: b

8. Which of the following return true?

a) "john" = = "john"
b) "john".equals("john")
c) "john" = "john"
d) "john".length()==4

Your answer: b, d

9. Which of the following are acceptable to the Java compiler?

a) if (2 == 3) System.out.println("Hi");
b) if (2 = 3) System.out.println("Hi");
c) if (true) System.out.println("Hi");
d) if (2 != 3) System.out.println("Hi");
e) if ("HELLO".equals("hello")) System.out.println("Hi");

Your answer: a, c, d, e

10. Consider the following four programs and answer the question below.

```
public class MyProgramA{
    public static void main(String args[]){
        String s = “Hello”;
        System.out.println( s==s.substring(0, s.length()) );
    }
}
```

```
public class MyProgramB{
    public static void main(String args[]){
        String s=”Hello”;
        System.out.println( s==s.substring(0, s.length() -1) );
    }
}
```

```
public class MyProgramC{
    public static void main(String args[]){
        String s=”Hello”;
        System.out.println( s==s.substring(0) );
    }
}
```

```
public class MyProgramD{
    public static void main(String args[]){
        String s=”Hello”;
        System.out.println( s==s.substring(s.length()) );
    }
}
```

Which of the following statements is true?

a) All of the above programs produce a compile-time error.
b) When run, **MyProgramA** and **MyProgramC** output: **true**
c) When run, **MyProgramB** outputs: **true**
d) When run, **MyProgramD** output: **true**
e) None of the above is true.

Your answer: e

Part III Short Answers 16 marks

1. **(6 marks)**
   What is the output produced after running the following program?
   Note that if there are blanks in your output, please clearly indicate them.

```
import java.util.*;

public class MyStringManip{

        public static void main(String args[]){

            String s = “(5+11)/2-3^4”;
            StringTokenizer t = new StringTokenizer(s,”0123456789”);
            String buf = ””;
            for(int i=0; i < t.countTokens(); i++)
                    buf+= t.nextToken();
            System.out.println(buf);

        }
}
```

Your answer: (+)/

Each token is 1 mark, if there are no blanks among tokens, 2 marks.
If your answer is ***(+)/-^, 4 marks only.***

2. **(10 marks)**

What is the output in the code segment

```
public class MyClass {

/*
    replaceAll(String regex, String replacement)
 Replaces each substring of this string that matches the given regular
 expression with the Consider a variable named “array_int” which refer to a
  two dimensional array of integers. Write a program fragment using “while”
  loop statement and at most 3 local variables to calculate the sum of all the
  integers in this array.  given replacement.  e.g if s1 is baaabaaa
   s1.replaceAll("aaa","111") will result to s1 being b111b111
*/

  public static void main(String args[]) {

      String s1 = new String("networks are thousand years old");
      String s2 = new String();

      System.out.println(s1);

      System.out.println("result of 1 is " + s1.valueOf((s1.charAt(7))));
      System.out.println("result of 2 is " + s1.indexOf(s1,s1.length()));
      System.out.println("result of 3 is " + s1.length());
     System.out.println("result of 4 is " +
              s1.replaceAll(s1.substring(s1.length() – 9),"yep" ));
      System.out.println("result of 5 is " + "peace".compareTo(s1) );
      System.out.println("result of 6 is " + s1.lastIndexOf("s") );
      System.out.println("result of 7 is " + s1.lastIndexOf("w") );
      System.out.println("result of 8 is " + s1.lastIndexOf("yep",s1.length()) );
      System.out.println(s1);
  }
}
```

Your answer:

networks are thousand years old	**(0.5 mark)**
result of 1 is s	**(1 mark)**
result of 2 is -1	**(1 mark)**
result of 3 is 31	**(1 mark)**
result of 4 is networks are thou	**(1 mark)**
result of 5 is 2	**(1 mark)**
result of 6 is 26	**(1 mark)**
result of 7 is 3	**(1 mark)**
result of 8 is -1	**(1 mark)**
networks are thousand years old	**(0.5 mark)**

Part IV Problems 54 marks

Question 1: (10 marks)

Write a recursive method that takes an integer argument n and returns the sum of the numbers from 1 to n recursively. Assume the argument n > 1.

Your answer:

```
public int MyMehtod (int n) {

        int sum=0;
        if (n==1)
            return 1;
        return MyMethod(n-1)+n;
}
```

1. if there is no calling of the same method, 0 mark.
2. input argument should be int 1 mark
3. return int 1 mark
4. the header of the method declaration 2 marks
5. the program recursive structure 4 marks
6. the proper termination condition 2 marks

7. Question 2: (12 marks)

Consider the following program:

```
public class MyClass
{
  public static int myMethod( int x, int y )
  {
    if ( y == 0 )
          return 0;

    if ( y > 0 )
         return x + myMethod( x , y - 1 );

    return x + myMethod( x , y + 1 );
  }

  public static void main( String args[] )
  {
    System.out.println( "Applying myMethod to 8 and -5 results: " +
                              myMethod( 5, -3) );
  }
}
```

a. What is the purpose of the method myMethod?
b. What is the output of the program?

Your answer:

a. The method MyMethod returns the absolute value of the product of the two arguments. (6 marks)

If the student describes how the program works, 0 marks.

b. Applying myMethod to 5 and -3 results: 15
(6 marks for correct answer)

Question 3: (12 marks)

Write a method using “while” loop and at most 3 local variables to calculate the sum of all the integers in a two-dimensional array of integers. The method should have only one argument which receives the array from the caller and the method should return an integer value indicating the sum calculated.

Your answer:

```
public int sum(int array[][]) {
        int sum=0;
        int i=j=0;

        while(i<array.length) {
                while (j<arrary[i].length) {
                        sum+=array[i][j];
                        j++;
                }
                j=0;
                i++;
        }
        return sum;
}
```

input argument should be 2-dimension array	1 mark
return int	1 mark
the header of the method declaration	1 marks
use of 3 local variables	3 marks
proper usa of length variable	3 marks
proper use of while loops	3 marks

Question 4: (20 marks)

The following program converts the user input from degree Celsius to Fahrenheit and from Fahrenheit to degree Celsius. First, the program prompts the user to choose one of the following options:

1 for Fahrenheit to Celsius.
2 for Celsius to Fahrenheit.
3 to quit.

Then, the user enters the temperature to be converted.

The program displays the results in a message dialog.

The program keeps prompting the user to enter a choice till the user enters anything other than 1 or 2 to quit.

All input/output operations are done using methods in the class JOptionPane.

The formulas for the conversions are:

tempInCelsius=5*(tempInFahrenheit-32)/9,

tempInFahrenheit= tempInCelsius*9/5+32.

The program contains <u>syntax</u>, <u>run-time</u> and <u>logical errors</u>. Find and fix all errors. You are NOT allowed to rewrite the program on your own idea. Your correction must be based on the provided program. Clearly and properly document the changes you make.

<u>See the program on the next page.</u>

```
1.    import java.io.*;

2.    public Temperature{

3.    public static main( String args[] ) {

4.          Integer option;
5.          String input;
6.          JTextArea outputArea;
7.          option = 0;

8.          while ( true  ){

9.                input = JOptionPane.showInputDialog (
10.                     " 1 for Fahrenheit to Celsius\n" +
11.                     " 2 for Celsius to Fahrenheit\n 3 to quit:" );

12.               option = integer.parseIt( input );

13.               if( option == 1 || option == 2 )

14.                     input  = JOptionPane.showInputDialog(
15.                                   "Enter tmperature: " );

16.               if ( option == 1 )
17.                     outputArea.append("The temp. in Celsius is: "+
18.                           fahToCel( Integer.parseIt(input)));

19.               else if ( option == 2 )
20.                     outputArea.append("The temp. in Fahrenheit: "+
21.                           celToFah( Integer.parseIt(input)));

22.               else break;

23.               JOptionPane.showMessageDialog(null, outputArea);
24.         }
25.   }

26.   public void fahToCel(int f ) {    return ( f - 32 ) * 5 / 0;     }

27.   public static int celToFah( int c ) {   return ( c * 9 / 5 ) + 32;   }
28.   }
```

Solution

```
import javax.swing.*;

public class Temperature{
  public static void main( String args[] ) {
        int option;
        String input;
        JTextArea outputArea = new JTextArea(1,15 );
        option = 0;

        while ( option != 3 ){
          input = JOptionPane.showInputDialog(
                    " 1 for Fahrenheit to Celsius\n" +
              " 2 for Celsius to Fahrenheit\n 3 to quit:" );

          option = Integer.parseInt( input );

         if( option == 1 || option == 2 )
                input  = JOptionPane.showInputDialog( "Enter tmperature: " );
          if ( option == 1 )
                outputArea.append("The temp. in Celsius is: "+fahToCel(
Integer.parseInt(input)));
              else if ( option == 2 )
                outputArea.append("The temp. in Fahrenheit: "+celToFah(
Integer.parseInt(input)));
               else break;
              JOptionPane.showMessageDialog(null,outputArea);
        }
  }

  public static int fahToCel(int f ) {    return ( f - 32 ) * 5 / 9;    }

  public static int celToFah( int c ) {  return ( c * 9 / 5 ) + 32;   }

}
```

10 fixes, each one 1 mark for identifying it, 1 mark for fixing it.