CM1601: Programming Fundamentals

School	School of Computing
Course	BSc (Hons) Artificial Intelligence and Data Science
Stage	Year 1
Academic Year	2021
Semester	Semester 2 (Refer)
Date	10th September 2021
Start Time	2:00 PM
End Time	4:30 PM
Duration	150 mins
No. of Pages (including cover sheet)	10

Instructions to Candidates

You are advised (but not required) to spend the first ten minutes of the examination reading the questions and planning how you will answer those you have selected.

This examination paper comprises 3 sections. Answer all the questions

Section A (30 Marks)

Section B (35 Marks)

Section C (35 marks)

THIS PAPER MUST NOT BE TAKEN OUT OF THE EXAMINATION ROOM
DO NOT TURN OVER THIS PAGE UNTIL THE INVIGILATOR INSTRUCTS YOU TO DO SO

Special Stationery (if applicable)

You may make use of a non-programmable calculator in this exam.

Section A

QUESTION 1

The size of an array can be determined using:

A) sizeof(array)

B) array.len

C) array.length

D) array.sizeof()

QUESTION 2

Generating an object from a class can be called as:

A) Instantiating

B) Declaration

C) Initializing

D) Interfacing

QUESTION 3

Which of the function header is valid?

A) `def fun(a = 2, b = 3, c)`

B) `def fun(a = 2, b, c = 3)`

C) `def fun(a, b = 2, c = 3)`

D) `def fun(a, b, c = 3, d)`

QUESTION 4

What is the correct output of the following code snippet?

```
public
    static void main(String[] args)
    {
        int x = 30;
```

```
        System.out.println(x);
    }
    static
    {
        int x = 20;
        System.out.print(x + " ");
    }
```

A) 20 30

static methods execute before the main method

B) 30 20

C) 20 20

D) 30 30

QUESTION 5

Predict the output of the following program?

```
list1 = [1, 2, 3, 4, 5]
list2 = list1
list2[0] = 0;
print("list1= : ", list1)
```

changes the value of the first index to 0

A) list1= : [0, 2, 3, 4, 5]

B) list1= : [1, 2, 3, 4, 5]

C) Compilation error

D) None of the above

QUESTION 6

What is the correct output of the following code snippet?

```
public class Circle {
     private Circle(int w) { // line 2
          System.out.print(w);
     }
     public static Circle() { // line 5
```

```
            System.out.print(10);
      }
      public static void main(String args[]) {
            Circle circle = new Circle(50);
      }
}
```

A) Won't compile because of line (2), constructor can't be private

B) 10 50

C) 50

D) Won't compile because of line (5), constructor can't be static constructors don't have a return type.

QUESTION 7

Which of the following is an invalid statement?

A) `xyz = 1,000,000`

B) `x y z = 1000 2000 3000`

C) `x,y,z = 1000, 2000, 3000`

D) `x_y_z = 1,000,000`

QUESTION 8

What will be the output of the following program?

```
def test_func(value, values):
    value = "10"
    values[0] = 44

t = "3"
v = [1, 2, 3]
test_func(t, v)
print(t, v[0])
```

A) 1 1

B) 10 44

C) 3 1

D) 3 44

QUESTION 9

Considering the following literals, which one can be accepted as a valid long literal?

a) 904423

b) L990023

c) 0xnf029L

d) ABH8097

QUESTION 10

Guess the output of the following program

```
i = 1
while True:
    if i % 3 == 0:
        break
    print(i)
    i + = 1
```

A) 1 2 3

B) 1 2

C) Syntax Error

D) None of these

QUESTION 11

Which of the following will be the infinite loops?

A) for(; ;)

B) for(i=0 ; i<1; i--)

C) for(i=0; ; i++)

D) All of the above

QUESTION 12

What will be the output of the following program?

```
abstract class MathCalculation
{
  static final float PI = 3.1415f;
}

public class AbstractDemo
{
  public static void main(String[] args)
  {
    System.out.println(MathCalculation.PI);
  }
}
```

A) Compilation error

B) No output

C) Run time error

D) 3.1415

QUESTION 13

Guess the output of the following program.

```
int i=0;
int j=7;
for(; (i<5) && (j++<10); i++){
    System.out.println(i+" "+j);
}
 System.out.println(i+" "+j);
```

A) 0 7 1 8 2 9 3 10

B) 0 8 1 9 2 10 3 11

C) 0 8 1 9 2 10 2 10

D) Compilation error

QUESTION 14

Predict the result

```
public class TestClass {
        public static void main(String[] args) {
        List<String> items = new ArrayList<>();
        items.add("Pen");
        items.add("Pencil");
        items.add("Box");
        for (String i : items) {
            if (i.indexOf("P") == 0) {
                continue;
            }
            else {
                System.out.print(i+" ");
            }
         }
        }
    }
```

A) Pen Pencil Box

B) Pen Pencil

C) Box

D) Compilation fails.

QUESTION 15

Which of the following is correct?

A) Instance variables declare inside the class with static prefix and outside of method

B) Class variables declare inside the class without static prefix and outside of method

C) Instance variables declare inside the class and outside of method

D) Class variables declare inside the class and outside of method

(2 * 15 = 30 marks)

```
public class FindMax {
   public static void main(String[] args) {
      // get command line arguments
      int arg1 = Integer.parseInt(args[0]);
      int arg2 = Integer.parseInt(args[1]);
      // use conditional operator to find the maximum
      int max_value = (arg1 > arg2) ? arg1 : arg2;
      // print the maximum value
      System.out.println("The maximum of " + arg1 + " and " + arg2 + " is " + max_value);
   }
}
```

Section B

Answer the following questions briefly.

QUESTION 1

Write a program to get two values as command line arguments and find the maximum of those two using conditional operator.

(4 marks)

QUESTION 2

the main difference between a Java while loop and a for loop is that a while loop is used when the number of iterations is not known beforehand, while a for loop is used when the number of iterations is known beforehand. A for loop is typically used when iterating over a collection or array, while a while loop is useful when repeating a set of instructions until a certain condition is met.

Explain the main difference of Java while and for loop.

(2 marks)

QUESTION 3

Prefix operators are operators that are placed before the variable, and they modify the value of the variable before using it

Briefly explain the prefix and postfix operators using examples.

(3 marks)

QUESTION 4

Postfix operators, on the other hand, are operators that are placed after the variable, and they modify the value of the variable after using it

Briefly explain the functionality of conditional operators in Java.

(3 marks)

QUESTION 5

Conditional operators, also known as ternary operators, are used in Java to evaluate a Boolean expression and return a value based on whether the expression is true or false. The conditional operator has the following syntax:

List down the primitive data types in Java.

(3 marks)

QUESTION 6

Figure out the output of the following program. Explain the reason behind the output.

```
public static void main(String args[]){
      final int i;
      i = 20;
      System.out.println(i+20);
}
```

(5 marks)

QUESTION 7

Type mismatch: Type casting can also result in a type mismatch if the casted value is incompatible with the target data type. For example, casting a String to an int will result in a compile-time error.

Runtime exceptions: Type casting can sometimes result in runtime exceptions, such as a ClassCastException, if the casted value is not actually of the expected type.

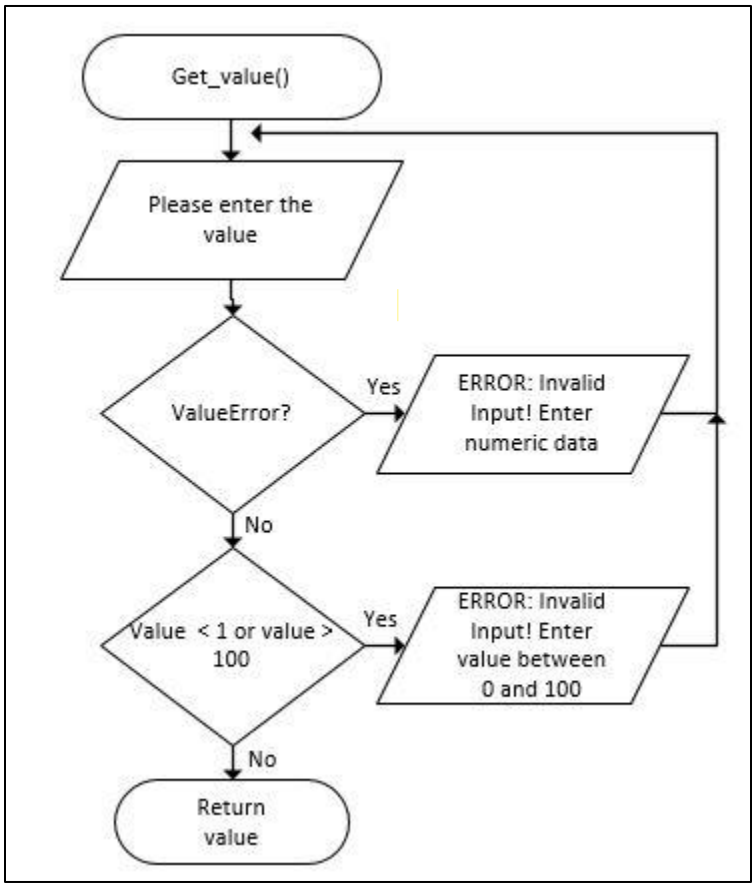
Briefly describe the possible issues in type casting.

Loss of data: When casting from a larger data type to a smaller data type, such as from double to int, some of the data may be lost. For example, when casting 3.14 to an int, the fractional part of the number will be lost.
Unexpected results: Type casting can sometimes result in unexpected values due to rounding or truncation. For example, when casting 3.6 to an int, the resulting value will be 3, even though one might expect it to be rounded up to 4.

(5 marks)

QUESTION 8

Implement the Java code for the following flow chart.



(5 marks)

QUESTION 9

Explain the reason behind the output.

```
public static void main(String [] args)
{
     int x= 0;
     int y= 0;
     for (int z = 0; z < 5; z++)
     {
         if (( ++x > 2 ) || (++y > 2))
         {
             x++;
         }
     }
     System.out.println(x + " " + y);
```

```
}
```

(5 marks)

Section C

QUESTION 1

Implement the Java classes (with full details of fields and constructors) which are required to simulate the following problem. Use Java to provide the solution.

A class called Circle contains two private instance variables, called radius (of type double) and color (of type String), with default value of 1.0 and "red", respectively. Two overloaded constructors must be defined where in the 1st constructor, which sets both radius and color to default while in the 2nd constructor with given radius, but color default. Additionally, there are two public methods called getRadius() and getArea().

(10 marks)

QUESTION 2

Consider the following scenario and implement the respective solution using Java or Python.

Animals eat different food. Herbivores are animals and they eat only plants. Carnivores consume only meat while Omnivores eat both plants and meat.

(10 marks)

QUESTION 3

Consider the following scenario and implement the respective java solution.

There are two kinds of employees. Part time employees and Full-time employees. For part time employees you must store the hourly rate. All full-time employees have an EPF number (e.g.: 45) and EPF rate (8%).
Part time employees, the salary is calculated as follows.

- *Salary = hourly rate * number on hours worked.*
- *The number of hours is entered by the user.*

Salary of the Full-Time employee is calculated as follows.

- *Gross salary = Basic salary - (EPF rate) + Allowance*

(15 marks)

END OF QUESTION PAPER