Faculty of Engineering, University of Jaffna

Department of Computer Engineering

EC5080: Software Construction

Lab – 01: Introduction to Java language features

Date: 27th April 2021 **Duration: 3 Hours**

1. Following Java program is written to check whether a given number is an *ugly number*. In number system, ugly numbers are positive numbers whose only prime factors are 2, 3 or 5. First ten ugly numbers are 1, 2, 3, 4, 5, 6, 8, 9, 10 and 12. By convention, number 1 is included.

   Test Data (Input an integer number): 235

   Expected Output: It is not an ugly number.

```java
public class UglyNumber {
    public static void main(String[] args){
        int n = 235;
        while (n != 1){
            if (n % 5 == 0) n /= 5;
            else if (n % 3 == 0) n /= 3;
            else if (n % 2 == 0) n /= 2;
            else System.out.print("It is not an ugly number.");
        }
        System.out.print("It is an ugly number.");
        System.out.print("\n");
    }
}
```

   i. Is there any difference between the output you get and the expected output?

   ii. If your answer for the above question is yes, modify the above code to print the correct output.

2. The code block below shows a **Python** program to count the number of even and odd numbers from a series of numbers.

```python
numbers = (1, 2, 3, 4, 5, 6, 7, 8, 9)
count_odd = 0
count_even = 0
for x in numbers:
        if not x % 2:
                count_even+=1
        else:
                count_odd+=1
print("Number of even numbers :",count_even)
print("Number of odd numbers :",count_odd)
```

   i. What will be the output for the above program? (You can use online Python editor to check the output)

   ii. Is Python a statically or dynamically typed language? Explain your answer.

iii. Implement the same functionality in Java.

iv. Modify your Java program to prompt the input from the user and count the odd and even numbers.

3.

i. Explain in detail how *stack* and *heap* memory are used.

ii. In which memory area, the variable ***temp*** and variable ***card,*** declared in following Java program's main method, get stored? Explain your answer.

```
class CreditCard{
    int num;
}
public class Bank {
    public static void main(String[] args) {
        int temp;
        CreditCard card;

    }
}
```

iii. What is Garbage Collection in Java?

iv. Briefly describe the advantages and disadvantages of Garbage Collection technique implemented in Java.

v. The following Java program is a sample code to explain different ways of how objects are made eligible for garbage collection.

```
package lk.ac.jfn.eng.ec5080.l1;

public class Message {
    String message;

    public Message(String msg) {
        this.message = msg;
    }

    public void display() {
        print(this.message);
    }

    public void print(String message) {
        Message msg = new Message("The message: " + message);
    }

    public static void main(String[] args) {
        Message msg_1 = new Message("SC1");
        Message msg_2 = new Message("SC2");
        msg_1 = msg_2;
        msg_1.display();
        new Message("SC3").display();
        msg_1 = null;
        System.gc();
    }

    public void finalize() {
        System.out.println("'" + this.message + "'" + " successfully
garbage collected");
    }
}
```

a. The program produced following output when executed. Explain the reason of the output by highlighting the ways the objectes were garbage collected.

```
'The message: SC3' successfully garbage collected
'SC3' successfully garbage collected
'The message: SC2' successfully garbage collected
'SC1' successfully garbage collected
```

b. Will the program produce same output consistently when executed multiple times? Explain your answer briefly.

4. Write a Java Program to print the number of days in a given month of a year. The program should use following input and output format.

```
Input: February 2000
Output: 29
```

The program will be evaluated based on the correctness and efficiency. You are expected to consider following features of Java language wherever applicable to use best coding practices.

- control constructs
- static / dynamic typing
- scope and name-spaces

Instructions:

- Create a zip file named L1_2018_E_xxx which contains all the Java programs and the answer sheet.
- Upload the zip file on/before given deadline via team.
- Any plagiarized work will be given 0 marks.