KYAMBOGO UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

University Examinations 2017/2018

Second Year, Semester one Examination for Bachelor of Information Systems
(BIS II)

SIS2104: Object-Oriented Programming

Date: Friday, December 1, 2017   **Time: 8.00 a.m – 11.00 a.m**

Instructions to Candidates

- ❖ *This paper consists of **seven** questions, attempt any **five** questions.*
- ❖ *All questions carry equal marks.*
- ❖ *Start each question on a new page.*
- ❖ *Keep all answers within the context of Object-Oriented programming.*
- ❖ *Write all source-code in Java programming language.*

Question 1
a) Explain the following terms:
   i) Object
   ii) Class
   iii) Encapsulation
   iv) Instantiation
   v) Data hiding   **[10 marks]**
b) i) Explain the concept of garbage collection.   **[2 marks]**
   ii) How is garbage collection achieved in Java?   **[2 mark]**
   iii) How does it differ in other object-oriented programming languages
       like C++?   **[2 mark]**
c) Write code which demonstrates the way in which memory is allocated and initialized in
   Java.   **[4 marks]**

Question 2
a) You have been asked to advise the manager of an IT department on the choice of
   programming language. The manager wishes to know whether the use of an object
   oriented programming language would increase programmer productivity. Write a
   report that sets out the potential benefits and disadvantages of deploying an object
   oriented language.   **[8 marks]**
b) What role(s) does abstraction play in object-oriented programming?   **[4 marks]**
c) What is the difference between instance and class variables?   **[2 marks]**

d) Consider the following class:

```
public class IdentifyMyParts {
      public final int x = 7;
      public int y;
}
```

i) What are the class variable(s)? ii) What are the instance variable(s)?   **[2 marks]**

e) In the larger view, the Java environment relies on several built-in class libraries. What is a class library? State the purpose of any four examples of Java inbuilt class libraries.   **[4 marks]**

Question 3

a) Create a class called `Score` that contains:-

i) private data members: two integers, `score1` and `score2`.   **[2 marks]**

ii) a constructor that accepts two integer values called `nScore1` and `nScore2` (denoting the scores for `score1` and `score2` respectively) which it uses to initialize `score1` and `score2`.   **[3 marks]**

iii) getter and setter methods for `score1` and `score2`. The setter methods should ensure that `score1` and `score2` are set to values between 0 and 100.   **[6 marks]**

iv) a method `public float averageScore(int aScore1 and aScore2)` which finds the average of `score1` and `score2`. The average score is calculated as `(score1+score2)/2`.   **[2 marks]**

v) a method `public void printAvgScore()` which outputs the average score returned by the method `averageScore` in part (iv).   **[2 marks]**

b) Create a class called `scoreDemo` that contains a `main` method which implements the following: **[1 mark]**

i) an instance of `Score` with `Score1=76 and Score2=54` as initial values.   **[2 marks]**

ii) get the average of the instance in part (i) and print it on the screen.   **[2 marks]**

Question 4

a) Explain the following terms with examples:
   i.   Super class
   ii. Sub class
   iii. Multilevel inheritance
   iv. Multiple inheritance   **[8 marks]**

b) Using Java language, explain how multilevel inheritance is implemented.   **[4 marks]**

c) Java does not support multiple inheritance. Explain how multiple inheritance can be realized in Java using an example.   **[4 marks]**

d) Discuss the visibility of protected class members (fields and methods) among classes and packages.   **[4 marks]**

Question 5

a) Discuss the concept of parameters. What are parameters for?   **[2 marks]**

b) There are two ways that a computer language can pass an argument to a subroutine, i.e. call by value and call by reference. Explain what the two ways mean.   **[4 marks]**

c) Explain with an example how Java language uses the two ways.   **[6 marks]**

d) What happens in Java when you add a keyword final to:
   i. a variable

      ii. a method

      iii. a class   **[6 marks]**

  d) What does it mean for a member of a class to be *static*?   **[2 marks]**

Question 6

a) Abstract classes are commonly used in object-oriented programming.
   What is an abstract class and what is their purpose?   **[3 marks]**

b) Discuss **two** differences between an abstract class and an interface. You must include Java
   code examples to supplement your discussion.   **[4 marks]**

c) Using Java code example, fully explain the concepts of method overloading and method
   overriding.   **[8 marks]**

d) What is constructor overloading? Explain why sometimes it is useful to overload a
   constructor?   **[5 marks]**

Question 7

a) Explain the two general categories of Java data types with examples.   **[4 marks]**

b) Using examples in Java do the following:

    i. Give two different ways to create a string object.   **[2 marks]**

    ii. Give two different ways to check if two Strings are equal.   **[2 marks]**

c) Describe the *switch* statement.
   What object types can be used in the *switch* clause?   **[4 marks]**

d) What output is produced by the following program segment? **Why**?
   (Recall that name.charAt(i) is the i-th character in the string, name.)   **[5 marks]**

```
String name;
int i;
boolean startWord;
name = "Richard M. Nixon";
startWord = true;
for (i = 0; i < name.length(); i++) {
    if (startWord)
        System.out.println(name.charAt(i));
    if (name.charAt(i) == ' ')
        startWord = true;
    else
        startWord = false;
}
```

e) What is the output of this program?   **[3 marks]**

```
class array_output {
    public static void main(String args[]){
        int array_variable [] = new int[10];
        for (int i = 0; i < 10; ++i) {
            array_variable[i] = i;
            System.out.print(array_variable[i] + " ");
            i++;
        }
    }
}
```