

# KYAMBOGO UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

University Examinations 2016/2017

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

**SIS2104: Object-Oriented Programming**

**Date: Friday, December 2, 2016**

**Time: 8.00 a.m – 11.00 a.m**

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## 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.*
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## Question 1

- a) What is object-oriented programming? **[2 marks]**
- b) Give **four** advantages of object-oriented programming over structured programming. **[4 marks]**
- c) Describe the following terms with examples:
  - i) Multiple Inheritance
  - ii) Single Inheritance
  - iii) Encapsulation
  - iv) Polymorphism
  - v) Data abstraction**[10 marks]**
- c) Distinguish between class variables and instance variables. **[4 marks]**

## Question 2

- a) Define the following terms:
  - i. Object
  - ii. Constructors
  - iii. Instantiation
  - iv. Garbage collection**[8 marks]**
- b) One way of passing an argument to a subroutine is call- by-reference.
  - i) What does it mean?
  - ii) Explain with an example how Java language uses this approach. **[4 marks]**

- c) 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]**
- d) Describe what is meant by the term *operator overloading*. Explain two different ways of how a plus(+) operator can be overloaded. **[4 marks]**

### Question 3

- a) Distinguish between *getter* and *setter* functions, providing an example class definition containing one example of each. **[7 marks]**
- b) Briefly explain why a programmer may choose to designate class members as either *private*, *public* or *protected* within a single class. **[6 marks]**
- c) Define a super class and a subclass. **[2 marks]**
- d) Consider the class hierarchy in the code fragments provided below:

```
class C1{
    private int a;
    protected int b;
    public int c;
}
```

```
class C2 extends C1{
    private int d;
    protected int e;
    public int f;
}
```

```
class C3 extends C2 {
    private int g;
    public int h;
    protected int i;
}
```

State the classes in which each of the following integer variables can be accessed: a, b, c, d, e, f, g, h and i. **[5 marks]**

### Question 4

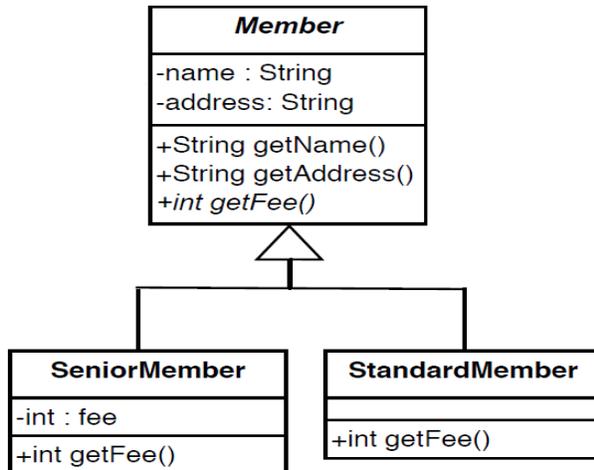
- a) What happens in Java when you add a keyword *final* to:
- i. a variable
  - ii. a method
  - iii. a class **[6 marks]**
- b) What does it mean for a member of a class to be *static*? **[2 marks]**
- c) Discuss the concept of parameters. What are parameters for? **[4 marks]**
- d) Write a function named “stars” that will output a line of stars to standard output. (A star is the character “\*”.) The number of stars should be given as a parameter to the function. Use a for loop. For example, the command “stars (20)” would output  

```
*****
```

**[5 marks]**
- e) How does Java attempt to simplify memory management? **[3 marks]**

### Question 5

Consider the following class diagram showing part of a program to manage the membership information for a professional society:



- Class **Member** is an abstract class. Explain the role of an abstract class. [2 marks]
- Write a Java version of class **Member** assuming it has this constructor:  
`public Member(String name, String address)`  
and that the method `getFee()` is abstract. [6 marks]
- Write a Java version of class **StandardMember** assuming it has this constructor:  
`public StandardMember(String name, String address)`  
and the standard membership fee is fixed at Ushs. 5000. [4 marks]
- Write a Java version of class **SeniorMember** assuming it has this constructor:  
`public SeniorMember(String name, String address, int fee)`  
where the membership fee is set when a **SeniorMember** object is created. [5 marks]
- Show how to create **StandardMember** and **SeniorMember** objects. [3 marks]

### Question 6

- What is type casting? When is it necessary? [4 marks]
- Give two conditions under which automatic conversion of types is possible. [4 marks]
- Describe casting of incompatible types with an example. [4 marks]
- Show the exact output that would be produced by the following `main()` routine: [3 marks]

```
public static void main(String[] args) {
    int N;
    N = 1;
    while (N <= 32) {
        N = 2 * N;
    }
}
```

```

        System.out.println(N);
    }
}

```

- e) 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;
}

```

### Question 7

- a) Describe what is meant by the term *method overloading*. Illustrate method overloading with Java code. **[5 marks]**
- b) Describe what is meant by the term *method overriding*. Illustrate method overriding with Java code. **[5 marks]**
- c) Is the following fragment correct? Explain.  

```

class X {
    int meth(int a, int b) { ... }
    String meth(int a, int b) { ... }
}

```
- d) What is a package? State **two** purposes of using packages in Java. **[4 marks]**
- e) What is an interface? **[2 marks]**
- f) Explain how Java uses interfaces to implement multiple inheritance. **[4 marks]**