

KYAMBOGO UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

University Examinations 2018/2019

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

SIS2104: Object-Oriented Programming

Date: Friday, November 30, 2018

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.*
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Question 1

- a) Explain what is meant by the following terms:
- i. Class
 - ii. Object instance
 - iii. Information hiding
 - iv. Encapsulation **(8 marks)**
- b) Explain how the concept of data abstraction is used in object-oriented systems.
Your answer should include an example to illustrate how this is used. **(4 marks)**
- c) Consider a library management system to be used by Barclays library in Kyambogo university. The system keeps track of borrowing and return of books.
Do the following:
- i) Identify three classes along with their data members (variables and methods) which may be suitable for this system. **(6 marks)**
 - ii) Identify any class variables for one of the classes you have identified in part (i). **(2 marks)**

Question 2

A University wishes to keep information on its students. Consider the following:

- The proposed `Student` class has the following instance variables: `StudentNo`, `StudentName`, `JavaCourseworkScore`, and `JavaExamScore`;
- The `JavaCourseworkScore` must be a number between 0 and 40;
- The `JavaExamScore` must be a number between 0 and 100;

- A class variable is also required, called `noOfStudents`, which will be incremented each time a `Student` instance is created.

Using Java object-oriented programming language, write code to perform the following.

- Show the declaration of the `Student` class containing:
 - Any *setter* and *getter* methods. The setter methods should ensure that `JavaCourseworkScore` can only have values between 0 and 40, and `JavaExamScore` can only have values between 0 and 100. **(7 marks)**
- A parameterized constructor that will be used to initialize new objects. **(3 marks)**
- A method `calculateTotal` which returns the total mark obtained by a student. Note that the `JavaExamScore` must be converted to out of 60 before being added to `JavaCourseworkScore`. **(5 marks)**
- A method `isPassed` which takes the value returned by `calculateTotal` and returns true or false depending upon whether the returned total is above 50. **(5 marks)**

Question 3

- Explain why a developer might declare a member function as private. **(2 marks)**
- Show an example code fragment, in Java, that contains both public and private variables to demonstrate how they may be used. **(4 marks)**
- Explain the difference between protected and private class members. **(4 marks)**
- Explain the difference between call-by value and call-by reference. **(4 marks)**
- What is the importance of using static variables in Java? Using an example of your choice, demonstrate the use of static variables. **(3 marks)**
- What does it mean for variables and methods to be declared as final? **(3 marks)**

Question 4

- Describe the **two** kinds of Java data types. Give at least **two** examples of data types for each kind. **(4 marks)**
- What is type casting? When is it necessary? **(4 marks)**
- Explain how Java handles memory management. **(4 marks)**
- Explain the difference between arrays and the Java's inbuilt `ArrayList` class. **(2 marks)**
- Describe the purpose of the following Java keywords: `Super`, `this`, and `new`. **(6 marks)**

Question 5

- Explain what is meant by the following:
 - Abstract class
 - Method overloading
 - Method overriding **(6 marks)**
- Using Java programming language:

Create an abstract class `Employee` with the following data members: `employeeName`, `employeeNo` and an abstract method `calculatePay()` which returns the monthly pay of an employee. **(3 marks)**

Create the following two subclasses:

 - `FullTimeEmployee` with the following data members: `monthlySalary`, `housingAllowance` and a method `calculatePay()` which returns the monthly pay of a full time employee. **(3 marks)**

- PartTimeEmployee with the following data members: hourlyRate, hoursWorked, transportAllowance and a method calculatePay() which returns the monthly pay of a part time employee. **(3 marks)**

Create another class EmployeeTest which contains two objects; one of type FullTimeEmployee and another PartTimeEmployee. Display Employee no, name and monthly pay for both objects. **(5 marks)**

Question 6

- a) Explain the concept of inheritance in object-oriented programming. **(3 marks)**
- b) State the reasons why a programmer would want to use inheritance when developing a system. **(4 marks)**
- c) Explain the following types of inheritance giving examples:
 - i. Single inheritance
 - ii. Multiple inheritance
 - iii. Multi-level inheritance **(6 marks)**
- d) Using an example of your choice, explain how to implement hierarchical inheritance in Java. **(7 marks)**

Question 7

- a) What is the importance of Java packages? Give at least **three** Java inbuilt packages stating their role. **(4 marks)**
- b) What are interfaces in Java? Give at least **three** differences between abstract classes and interfaces? **(4 marks)**
- c) Explain with sample code in Java how interfaces assist programmers to implement multiple inheritance. **(6 marks)**
- d) Describe how the various access specifiers apply to Java packages. **(6 marks)**

END