2920/203
OBJECT ORIENTED PROGRAMMING
July 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION TECHNOLOGY

MODULE II

OBJECT ORIENTED PROGRAMMING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have an answer booklet for this examination.
*This paper consists of **EIGHT** questions.*
*Answer any **FIVE** in the answer booklet provided.*
All questions carry equal marks.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) (i) Outline **four** characteristics of abstract data types (ADTs). (4 marks)

(ii) Explain the term message as used in OOP. (2 marks)

(b) With the aid of a C++ example in each case, differentiate between a variable and a constant. (4 marks)

(c) Describe **two** circumstances under which the *do..while loop* is most applicable in OOP. (4 marks)

(d) Write a C++ program that implements a class named *myclass* with the following features: (6 marks)

- Data members *a* and *b*;
- A member function named *set1* to assign characters 'O' and 'P' to *a* and *b* respectively, and outputs a concatenation of *a* and *b*.

2. (a) Explain the purpose of using the *namespace std* in C++ programs. (2 marks)

(b) (i) Distinguish between *struct* and *class* data structures as used in C++. (4 marks)

(ii) Outline **four** categories of operators used in C++ giving an example in each case. (4 marks)

(c) Draw a program flowchart to show the execution logic of a while loop structure. (4 marks)

(d) Write a C++ program that would implement a class with the dimensions of a cylinder as data members. The program should then accept the dimensions, determine and display the volume of the cylinder using a friend function. (6 marks)

3. (a) Outline **four** typical features of object oriented programming that makes it popular in application development. (4 marks)

(b) (i) Explain **two** aims of object oriented analysis and design (OOD). (4 marks)

(ii) Differentiate between *accessor operation* and *setter operation* as used in OOP. (4 marks)

(c) Design two classes with relevant data and methods that can be used to manage the following communication model in a college. (8 marks)

The *Whatsup* group directory of a college contains entries for each person in the college i.e. student, tutor, and staff member. Users of the directory can look up names, set phone number and chat. However, the administrator of the directory can, after supplying a password, insert new entries, delete existing entries, modify existing entries, print the telephone directory, and print a listing of all students or of all members of staff.

4. (a) Explain the following terms as used in OOP:

(i) instantiation; (2 marks)

(ii) access specifier. (2 marks)

(b) Describe the circumstance under which each of the following C++ program elements are most applicable:

(i) Scope resolution operator; (2 marks)

(ii) Object parameter. (2 marks)

(c) Write a C++ program segment to demonstrate the use of *this pointer* in a *constructor*. (4 marks)

(d) (i) Outline **one** advantage and **one** disadvantage of using overloaded functions in OOP. (2 marks)

(ii) Write a C++ program that will accept the dimensions of a cuboid and use an overloaded function called *calculate* to determine the cross-sectional area or volume of the cuboid. Display the area and volume accordingly. (6 marks)

5. (a) Outline **four** rules of setting destructors in OOP. (4 marks)

(b) (i) Explain **two** ways in which copy constructors are used in C++ programs. (4 marks)

(ii) Distinguish between *text file* and *data file* as applied in C++ programs. (4 marks)

(c) Write a C++ program that will initialize two objects, Ob1 (7, 8) and Ob2 (2, 5), using a constructor. The program should then determine the difference of the objects using an overloaded operator and display the values of resultant object. (8 marks)

6. (a) (i) List **four** operators that cannot be overloaded. (2 marks)

(ii) Outline **two** restrictions that must be considered when overloading operators in OOP. (2 marks)

(b) (i) Explain **two** benefits of using files in OO programs. (4 marks)

(ii) Distinguish between a *stream* and a *template class* with respect to C++ files. (4 marks)

(c) Evaluate the following C++ statement clearly showing your working.

9 * 3 + 32 / 15 % 7 – 2 < 12 + 5 * 2 – 9 / 3 (2 marks)

(d) Figure 1 shows the relationship between two classes. Write a C++ program to implement the relationship and output a, b and sum of all the data members. (6 marks)

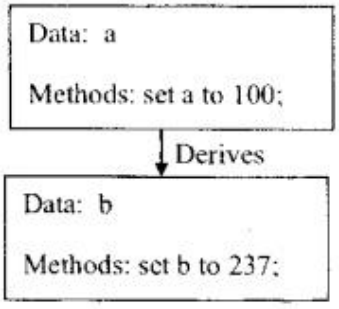

Figure 1

7. (a) (i) Explain the following terms as in inheritance:

I. override; (2 marks)

II. variance. (2 marks)

(ii) Describe the circumstance under which a virtual base class is applicable in OOP. (2 marks)

(b) (i) Files can be implemented using different open modes based on their purpose. Assuming C++ programming language, outline **four** values of the openmodes. 4 marks)

(ii) Write a C++ program segment that would open a marks database file for reading, after verifying that it is open, and outputs the contents to the screen. Note that the file contains examination marks only. (4 marks)

(c) With the aid of an example in each case, explain **three** types of polymorphism applicable in OOP. (6 marks)

8. (a) (i) Write the C++ general syntax for a polymorphic class. (3 marks)

(ii) Differentiate between *abstract base* class and *normal base* class as used in OOP. (4 marks)

(b) (i) *Sharing is the basic idea of inheritance*. Justify this statement with respect to OOP. (3 marks)

(ii) A student intends to solve a programing problem using a constructor and a destructor in both the base and derived classes. With the aid of a C++ program segment, demonstrate the process of creating and deleting the respective objects. (6 marks)

(c) A software development company has adopted OOP in its current projects. Explain **two** ways in which the company would use to cope with the emerging trends in OOP. (4 marks)

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