Name_____ Index No._____/_____

2920/203
OBJECT ORIENTED PROGRAMMING
November 2015
Time: 3 hours

Candidate's Signature _____

Date_____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.
Sign and write the date of examination in the spaces provided above.
*Answer any **FIVE** of the following **EIGHT** questions in the spaces provided*
***ALL** questions carry equal marks.*
Candidates should answer the questions in English.

For Examiners Use Only

Question	1	2	3	4	5	6	7	8	TOTAL SCORE
Candidate's Score									

This paper consists of 16 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** benefits of using OOP in application development. (4 marks)

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

(b) Distinguish between *global* and *local* objects as used in OOP. (4 marks)

(c) With the aid of an illustration, explain the concept of message passing in OOP. (4 marks)

(ii) Outline **three** access specifiers used in OOP. (3 marks)

(c) Differentiate between *structures* and *classes* as applied in C++ programs. (3 marks)

(d) Interpret the following C++ program. (6 marks)

```
#include < iostream >
using namespace std;
class Point {
int _x, _y;
public:
Point() {
_x = _y = 0;
}
Point(const int x, const int y) {
_x = x;
_y = y;
}
void setX(const int val);
void setY(const int val);
int getX() { return _x; }
int getY() { return _y; }
};
```

3. (a) Joseph intends to use abstract data types (ADT) in his programming project. Outline **three** characteristics of ADTs that he would implement. (3 marks)

(b) (i) Explain the circumstance under which each of the following program elements are most applicable during program writing:

I. conditional operator; (2 marks)

II. double data type. (2 marks)

(ii) Explain the term *value parameters* as used in OOP. (2 marks)

(c) Assuming that you have been requested to automate the mobile phone messaging system using OOP. Suggest **two** possible *classes* and **two** possible *methods* that you would use justifying your answers. (4 marks)

(d) Phoebe would like to write a program to add and multiply numbers. She has decided to use OOP and therefore she intends to implement an array of five *instances* of a class named *arithmetic* with the following properties:

- data members named *a* and *b*;
- a member function named *get* for accepting the values of *a* and *b*;
- a member function named *add* for determining and displaying the sum of the two numbers;
- a member function named *multiply* for determining and displaying the product of the two numbers.

Using C++ programming language and a *for loop* structure, write a program that would assist Phoebe achieve her objective. (7 marks)

4. (a) (i) Describe **two** ways of allocating the values of an object to another in OOP. (4 marks)

(ii) Outline **two** varieties of classes that could be created in OOP. (2 marks)

(b) (i) With the aid of an example, describe *object pointers* as applied in C++ programs. (4 marks)

(ii) Distinguish between a *function* and an *inline function* as used in C++ programs. (4 marks)

(c) Write a C++ program that creates an object with data members *a* and *b* initialized to 5 and 7 respectively. The program should then use a friend function to swap, subtract 2 from each value and display the resultant values of the object. (6 marks)

5. (a) Sonia has been asked to implement the following OOP concepts in her trade project. Explain the circumstance under which each of the concepts will be most applicable:

(i) copy constructor; (2 marks)

(ii) this function. (2 marks)

(b) With the aid of general formats, distinguish between *new()* and *delete()* as used in C++ programs OOP. (4 marks)

(c) With the aid of a C++ program segment, explain *function overloading* as applied in OOP. (4 marks)

(d) Write a C++ program that will implement a class with the following properties:

- Has x and y as data members;
- Member function used to initialize the values of x and y;
- Overloaded operator for checking equality.

The program should create two objects with a and b values as (9,12) and (3,4) respectively, compare the values of the objects using the overloaded operator and output the appropriate message. (8 marks)

6. (a) (i) Outline **four** rules that should be considered when implementing constructors in OOP. (4 marks)

(ii) Explain the reason why destructors cannot be overloaded in OOP. (2 marks)

(b) Joseph would like to implement the prefix and postfix increment operator on a class. Assuming C++ programming language, explain the logic he would use to achieve his objective. (4 marks)

(c) Figure 1 shows the design of multiple inheritance implemented in an application.

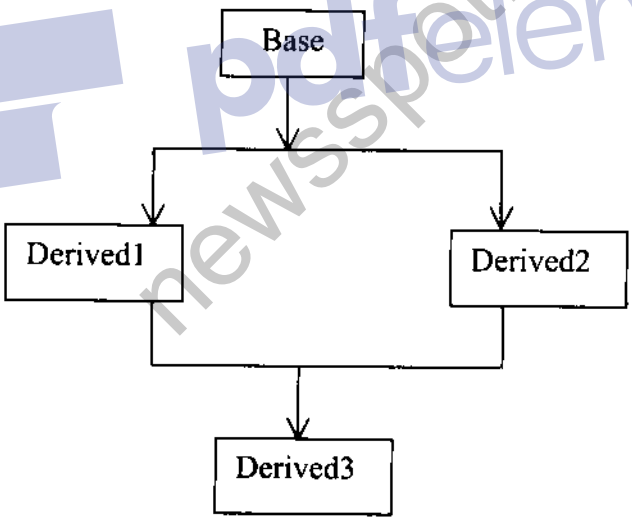

Figure 1

(i) This form of inheritance is prone to ambiguity. Explain the remedy used by programmers to ensure accuracy when handling this form of inheritance. (4 marks)

(ii) Assuming that the integers *a*, *b* and *c* are data members of base, derived1 and derived2 respectively, write a program segment that would use a member function of derived3 to determine the product of *a*, *b* and *c*. (6 marks)

7. (a) The ICT departments in learning institutions have laid out measures to cope with the emerging trends in OOP. Explain **two** such measures used in tertiary institutions. (4 marks)

(b) (i) Outline **three** types of file streams used in OOP. (3 marks)

(ii) Explain the function of each of the following values of type *openmode* as used in C++ files:

I. ios::ate; (1 ½ mark)

II. ios::trunk. (1 ½ mark)

(c) Write a C++ program that will carry out the following:

- defines a class named *objects* that has data members named *r* and *h*. The class has also a member function named *set* which is used to initialize the values of the data members of the object;
- implements a polymorphic function named *volume* which determines the volume of a cylinder and volume of a cone;
- outputs the volume of a cylinder and the volume of a cone given that both have r and h as 7 cm and 20 cm respectively.

Use *pointers* to initialize the objects and *pie* as 3.142. (10 marks)

8. (a) (i) Explain the importance of destructor functions in OOP. (2 marks)

(ii) Outline **two** features of a destructor function as applied in OOP. (2 marks)

(b) (i) With the aid of an example in C++ programming language, describe a *pure* virtual function (3 marks)

(ii) Distinguish between *early binding* and *late binding* as applied in OOP. (4 marks)

(c) Write a C++ program that would output the following string to a file after verifying that the file is open or not.

"OOP is powerful
Develop applications in OOP"

(5 marks)

(d) ABC is a software company that implements its applications using polymorphism. Explain **two** advantages of this concept in application development. (4 marks)