2920/203
OBJECT ORIENTED PROGRAMMING
November 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE II

OBJECT ORIENTED PROGRAMMING

3 hours

INSTRUCTIONS TO THE CANDIDATE

*Answer **FIVE** of the following **EIGHT** questions 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 **three** typical steps of writing an object-oriented program. (3 marks)

(ii) Explain **two** advantages of OOP over structured programming. (4 marks)

(b) Distinguish between *implicit* and *explicit* type casting as used in C++programs giving an example in each case. (4 marks)

(c) Explain the circumstance under which the following data types are most applicable in OOP:

(i) struct; (1 ½ marks)

(ii) class. (1 ½ marks)

(d) Write an object-oriented program in C++ that would accept the dimensions of a right-angled triangle, determine and output its perimeter. Use appropriate data members and one function member. (6 marks)

2. (a) (i) Outline **four** properties of unstructured programming languages. (4 marks)

(ii) Explain the terms *state* and *behavior* as used in OOP. (4 marks)

(b) Distinguish between *selector* operations and *conversion* operations as applied on objects in OOP. (4 marks)

(c) Study the following C++ program segment and answer the question that follows.

```
#include <iostream>
using namespace std;
class myclass {
int a;
public:
void set_a(int i){a=i;}
};
```

Interpret the program segment clearly outlining the access specifiers used. (3 marks)

(d) Write a C++ program that will create an object from a class named *marks* with the following properties:

- a data member named scores which is an array of 6 elements;
- a member function named *mean* for inputting the marks, calculating the mean and outputting the mean score.

(5 marks)

3. (a) Evaluate each of the following C++ statements:

(i) `k = 6* 5/ (5%3) – 3^2 + 2*10;` (2 marks)

(ii) `78 >= (128%20) ^2 + 2*4 – 100/5;` (2 marks)

(b) (i) State **one** advantage and **one** disadvantage of using in-line functions in OOP. (2 marks)

(ii) Explain the term *dereferencing* as used in object-oriented programs. (2 marks)

(c) With the aid of a C++ program segment, explain the role of a friend function in OOP. (5 marks)

(d) Write a C++ program that uses an overloaded function named *calculate* to determine the area or volume of rectangular objects based on the number of parameters provided. The program should determine and output area or volume appropriately for Object1(12,8) and Object2(6,5,4). Use function prototypes. (7 marks)

4. (a) (i) Explain the term *free store* as used in OOP. (2 marks)

(ii) Distinguish between a *null pointer* and a *dangling pointer* as used in OOP. (4 marks)

(b) Outline **four** types of literals in C++ programming. (4 marks)

(c) With aid of a C++ oriented general syntax, explain a copy constructor as used in OOP. (4 marks)

(d) Write a C++ program that implements a class with the following properties:
- data members as a, b and c i.e. principal amount, interest rate p.a and number of years respectively that are initialized as 10000, 0.2 and 4;
- member function for calculating and outputting the interest on the principal amount.

Use a constructor. (6 marks)

5. (a) Outline **three** situations when there is need to initialize an object during object-oriented programming. (3 marks)

(b) Explain the following terms as used in OOP:

(i) destructor; (2 marks)

(ii) reference. (2 marks)

(c) (i) Differentiate between *multilevel inheritance* and *multiple inheritance* as used in OOP. (4 marks)

(ii) Define the term *static object* as used in OOP. (2 marks)

(d) Write a C++ program that will implement a class named *reflection* whose objects A (2,4), B (2,7) and C (8,4) are reflected along the y-axis by negating the x-coordinates using an overloaded operator. The program should display the coordinates of the resultant image. (7 marks)

6. (a) Describe the following data types as used in OOP:

(i) enumerated; (2 marks)

(ii) nested class. (2 marks)

(b) (i) State **four** bitwise operators used in C++ programming. (2 marks)

(ii) Overloading is a type of polymorphism in OOP. Justify this statement with respect to addition operator. (4 marks)

(c) Prince has been advised to exploit inheritance when designing his OOP project. Outline **four** benefits of inheritance that could have influenced the advice. (4 marks)

(d) Write a C++ program that will open a file named *myfile* on drive F for output (capture an error if the file is not open). The program should then output the string "Polymorphism and Inheritance" to the file and close it. (6 marks)

7. (a) Outline **four** values of type *openmode* used in C++ file operations. (4 marks)

(b) Explain the term *default constructor* as used in C++ programs. (2 marks)

(c) (i) With the aid of the general C++ syntax, explain inheritance as used in OOP. (3 marks)

(ii) Differentiate between *extension* and *limitation* as forms of inheritance used in OOP. (4 marks)

(d) John would like to use a polymorphic class to determine the volume of cones and cylinders. Write a C++ program that he would use to:

- define a class named *threeD* that has data members named *radius* and height, a parametric member function named *set* which is used to initialize the value of *radius* and *height* and a pure virtual function named *volume*;
- implement two derived classes from threeD named *cone* and *cylinder* whose radius and height are 14 cm and 8 cm respectively.

The program should then output the volume for the *cone* and *cylinder*. Use pie as 3.142 and pointers appropriately. (7 marks)

Hint:
Volume of cone = $1/3\pi r^2h$
Volume of cylinder = πr^2h

8. (a) Outline **two** advantages of using files over simple data types in OOP. (2 marks)

(b) Distinguish between *virtual functions* and *overloaded functions* as used in C++ programs. (4 marks)

(c) (i) Explain **two** challenges of deploying OOP in a company's software. (4 marks)

(ii) It is important to undertake the integration stage for OOP projects. Explain the significance of this stage. (2 marks)

(d) Write a C++ program that uses a constructor to create two instances of a class named *triangle*. The instances should be initialized as inst1(20, 10) and inst2(16,12), where the 1st and 2nd values represent the base and height respectively. The class should also contain a member function for determining and outputting the area of the triangle. (8 marks)

THIS IS THE LAST PRINTED PAGE.