

2920/203
OBJECT ORIENTED PROGRAMMING
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Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY
MODULE II

OBJECT ORIENTED PROGRAMMING

3 hours

INSTRUCTIONS TO THE CANDIDATES

*This paper consists of EIGHT questions.
Answer any FIVE questions in the answer booklet provided.
Candidates should answer the questions in English.*

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This paper consists of 5 printed pages.

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

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Turn over

1. (a) (i) List **four** simple data types used in C++ programs. (2 marks)
 (ii) Outline **two** guiding rules for naming variables in C++ programs. (2 marks)
 (b) Explain **two** features of a parameterized constructor as used in OOP. (4 marks)
 (c) Differentiate between *classes* and *structures* as used in OOP. (4 marks)
 (d) (i) Explain the term *recursive function* as used in C++ programs. (2 marks)
 (ii) Write a C++ program that will implement a class named cone with the appropriate dimensions only. The program should accept the dimensions and, determine and output the volume of the cone. **Hint: Volume = $\frac{1}{3}\pi r^2 h$.** (6 marks)

2. (a) Explain the procedure of destroying *local* and *global* objects in the same program. (4 marks)
 (b) C++ programming language supports object oriented programming. Outline **six** features that justify this statement. (6 marks)
 (c) Outline **four** forms of inheritance applied in OOP. (4 marks)
 (d) Write a C++ program that will implement a class with the properties in table 1. Use a pointer to access the appropriate member(s) of the class. (6 marks)

Feature

Description

Data member

Data structure to store number of votes for six polling stations.

Member function

Function to accept the numbers of votes for six polling stations, determine and output the total number of votes.

Table 1: Properties of a class

3. (a) Outline **four** components of a loop as used in C++ programs. (4 marks)
 (b) (i) Explain the term *internal documentation* as used in C++ programs. (2 marks)
 (ii) Outline **two** uses of program documentation. (2 marks)

- (c) Figure 1 shows debugging tools used in C++ programming. Explain the function of each of the tools labeled (i) and (ii). (4 marks)



Figure 1

- (d) A super class named object has the following properties:
- length and width as data members;
 - constructor.
- Write a C++ program to implement a sub class for the super-class. The sub-class has height and a method used to accept the value of height, determine and output the volume. The program should initialize length and width as 7.0 cm and 5.0 cm respectively. (8 marks)
4. (a) (i) Describe a *message* as applied in OOP. (2 marks)
Flow of control of interaction between objects
- (ii) Outline **four** properties of *abstract data types* (ADTs). (4 marks)
- (b) Explain the circumstances under which each of the following features are used in object oriented programming:
- (i) virtual base class; *inheritance based classes* (2 marks)
- (ii) friend function. *function is friend only when both classes are restricted structure of a class* (2 marks)
- (c) Distinguish between *states* and *behaviour* as used in OOP. (4 marks)
State - value in an object
behaviour - a set of states of an object.
- (d) Write a C++ program that outputs a string of characters from the keyboard to a file. (6 marks)
5. (a) Outline **four** benefits of inheritance in application development. (4 marks)
- Reuse of code
- Reduce further stage of design and develop
- (b) Explain **three** types of operations that could be carried out on a class. (6 marks)
Arithmetic - involve write
Evaluate - arithmetic action of binary values.
- (c) Distinguish between *cohesion* and *coupling* as applied to objects. (4 marks)
cohesion - associate values & things
coupling - pass of binding objects together for external performance.
- (d) Write a C++ program that will implement a class containing the dimensions of a rectangle and a parameterized function to initialize the dimensions an object of the class as 12cm and 5 cm respectively. The program should then pass the object to a function, which determines the length of the diagonal. Output the length of the diagonal. (6 marks)

6. (a) Assuming C++ programming language, describe the general syntax of copy constructors. (4 marks)
- (b) Inheritance can be an extension or a contraction. Explain these terms with respect to OOP. (4 marks)
- (c) With the aid of an example in each case, explain the following types of polymorphism:
- (i) coercion;
- (ii) parametric. (4 marks)
- (d) Peter would like to determine the difference between two 1x2 matrices (A [3 6] and B [2 4]) using OOP. Write a C++ program that could meet Peter's objective by using objects and an overloaded operator. The program should output the difference (A - B). (8 marks)

7. (a) (i) State **one** advantage and **one** disadvantage of using inline functions in OOP. (2 marks)
Adv - can access private & protected data *Disadv* - can only access the members of a particular class
- (ii) Explain each of the following terms as used in C++ programs:
- (I) access-specifier; how variables of a class are accessed (2 marks)
- (II) pass-by-value. - passing parameters to a function by their value (2 marks)
- (b) Differentiate between virtual functions and pure virtual functions as used in OOP. (4 marks)
Virtual functions
- (c) Augustina intends to use OOP software for software project. Explain **two** ways in which she could cope up with new versions and packages of the software. (4 marks)

- make an interface requirement
 - reuse the software as interface.

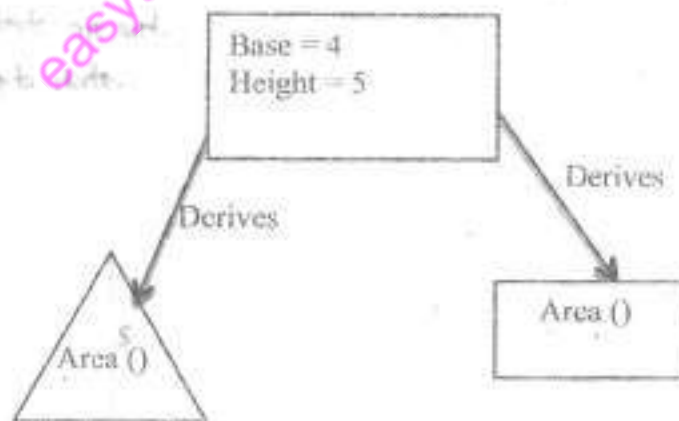


Figure 2

Write a C++ program that will implement the relationship depicted in the figure. The program should output the area of each child. (6 marks)

8. (a) Distinguish between *classes* and *structs* as used in OOP. (4 marks)
*class is a blueprint
struct is a variable used to store the data*
- (b) Describe **two** circumstances under which references could be used in OOP. (4 marks)
*pos by reference is parameter passing
implementing the use of pointers.*
- (c) Files can be accessed using different openmode values. Outline **four** such modes used in C++ programs. (4 marks)
- (d) Write a C++ program that would define an abstract base class named *bill* with data members named *units* and *standingfees*; a member function named *init* (for initializing *standingfee* and *units*) and a polymorphic function for determining the consumption cost. The program should implement the polymorphic function in two derived classes named *water* and *electricity* based on the following information:
- the standing fee for water and electricity is 50 and 200 respectively;
 - 100 units consumed for both water and electricity;
 - consumption cost for water = Standingfees + (units * 100);
 - consumption cost for electricity = Standingfees + (units * 2).

The program should output the consumption costs for water and electricity. Use *pointers* where applicable. (8 marks)

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