2920/103
STRUCTURED PROGRAMMING
July 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE I

STRUCTURED PROGRAMMING

3 hours

INSTRUCTIONS TO CANDIDATES

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

Turn over

1. (a) (i) Explain **one** disadvantage of using *goto* statement in a program. (2 marks)

(ii) Distinguish between *procedural* and *visual* programming. (4 marks)

(b) A student would like to write a program that could compute and display the average of 10 integers entered through the keyboard one at a time. Use a flow chart to design the program. (4 marks)

(c) Assuming Pascal programming language, evaluate the expression;

```
Z = a + b mod c * (d^2)
```

Given that a = 10, b = 23, c = 7 and d = 5. (4 marks)

(d) (i) The following are identifiers used by a student in C programming language during program writing.

myval, *const*, *integer* and *switch*

Citing a reason in each case, state whether these identifiers are valid or not. (4 marks)

(ii) Outline the function of preprocessor directives in C programming language. (2 marks)

2. (a) (i) Explain **one** type of error that may be encountered during program execution. (2 marks)

(ii) Write a program in Pascal language that would create a text file, write some text into the file and then close the file. (4 marks)

(b) Write a program in Pascal language that could be used to store in a record; *admission number*, *name*, *gender* and *age* of two students. (6 marks)

(c) (i) State **two** floating data types and their storage sizes as used in C programming language. (2 marks)

(ii) Write a program in C programming language that could generate random numbers between 0 and 1. (6 marks)

3. (a) (i) Define a *pointer* as used in Pascal programming language. (2 marks)

(ii) Distinguish between *register* and *static* storages as used in C programming language. (4 marks)

(b) Write a program in C programming language that would prompt a user to enter an integer. The program should then check whether the integer entered is a prime number and output the result. (6 marks)

(c) A program is required to prompt a user to enter two non-zero integers. The program then checks and outputs the larger integer.

(i) Write a pseudocode to represent the program logic. (4 marks)

(ii) Write a program in Pascal programming language to implement the logic. (4 marks)

4. (a) Outline **three** circumstances that would make a programmer to use a compiler during program writing. (3 marks)

(b) (i) Describe **three** types of operators used in C programming language. (6 marks)

(ii) The following program was created by a student during a programming lesson. Use it to answer the question that follows.

```
#include <stdio.h>
    main()
    {
     int a = 0;      int b = 15;     int c ;
        if ( a && b )
        {
           printf("Line 1 - Condition is true\n" );
        }
        if ( a || b )
       {
         printf("Line 2 - Condition is true\n" );
       }
     }
```

Interpret the program. (4 marks)

(c) (i) Outline **two** uses of comments in Pascal programming language. (2 marks)

(ii) A newly constructed computer lab is 15 meters long and 10 meters wide. The lab is to be fitted with floor tiles. Write a program in Pascal programming language that prompts a user to enter the length and width of the lab. The program then computes the number of tiles required. One tile has an area of $0.36M^2$. (5 marks)

5. (a) (i) Outline **two** reasons why program documentation is important. (2 marks)

(ii) Explain **three** types of program testing. (6 marks)

(b) Write an algorithm that may be used to remove an item from a queue. (4 marks)

(c) Differentiate between *procedure* and *function* as used in Pascal programming language. (4 marks)

(d) Write a program in C programming language that computes the sum of even numbers between 44 and 100 and output the result. Use *for* loop. (4 marks)

6. (a) Outline **two** advantages of modular programming approach. (2 marks)

(b) (i) Given data items: 56, 64, 40, 59, 34, 72 and 47.

I. Construct a binary tree; (3 marks)

II. State the degree of the binary tree constructed in I. (1 mark)

(ii) Outline **three** tree data structure traversals as used in programming. (3 marks)

(c) A newly established bank converts Kenya shillings to US dollars at the rate of 1 US dollar = 102 Kenya shillings. Write a program in C programming language that prompts a user to enter the currency either Ksh or USD. The program then outputs the equivalent amount. Use functions. (6 marks)

(d) Write a program in Pascal programming language that prompts a user to enter a string of characters. The program then outputs the number of characters in the string. (5 marks)

7. (a) Explain **two** approaches to programming that are used to implement stepwise refinement. (4 marks)

(b) Distinguish between *pre-increment* and *post-increment* as used in C programming language. (4 marks)

(c) (i) Define *quick sort* as used in programming. (2 marks)

(ii) Figure 1 shows a list of data items in an array. Use it to answer the question that follows.

58	72	45	64	32	54	42

Figure 1

Showing all the passes, sort the data in ascending order using bubble sort. (4 marks)

(d) Write a program in Pascal programming language that accepts three different courses and the number of male and female students per course. The program then outputs the information in tabular form. (6 marks)

8. (a) Explain **two** techniques that could be used to find an item in an ordered list. (4 marks)

(b) Distinguish between *actual* and *formal* parameters as used in programming. (4 marks)

(c) (i) A student created a program to implement stack data structure. When he executed the program an "underflow error message" was displayed. Outline a possible cause for this error. (2 marks)

(ii) Write a program in C programming language that would initialize the values 34, 40, 45, 48 and 53 in an array and get their sum. (4 marks)

(d) Table 1 shows the criteria used by the national government to allocate bursaries to college students. Use it to answer the question that follows.

Student Category	**Amount Allocated**
Needy	40,000
Special	40,000
Single	30,000
Marginalized	35,000
Other	10,000

Table 1

Write a program in Pascal programming that would prompt a user to enter student category. The program then outputs the corresponding amount. Use case statement. (6 marks)

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