

2920/103

STRUCTURED PROGRAMMING

July 2018

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.

- 1.
- (a) Outline **three** advantages of structured programming languages. (3 marks)
- (b) Differentiate between *low level* and *high level* programming languages. (4 marks)
- (c) Table 1 shows a five-day schedule of trips for students in various departments. Use it to answer the questions that follow.

Day	Destination
1	Tsavo
2	Mara
3	EPZ
4	Cocacola Plant
Other	Not applicable

Table 1

- (i) Draw a flowchart to represent the logic of a program that could accept the day number and output the destination. (6 marks)
- (ii) Using a *switch statement*, write a C program to implement the program logic. (7 marks)

2. (a) Explain each of the following statements as used in C programming:

- (i) `sentinel;` - a value which causes a loop to terminate. (2 marks)
- (ii) `break.` (2 marks)

- (b) Explain **two** disadvantages of monolithic programming. (4 marks)

- (c) Distinguish between *source code* and *object code* as used in programming. (4 marks)

- (d) The area A of a triangle is obtained using the formula $A = \sqrt{S(S-a)(S-b)(S-c)}$ where a, b and c are the dimensions of a triangle and $S = \frac{a+b+c}{2}$.

Write a C program that would prompt for the three dimensions of a triangle, computes the area and display the results to the nearest 3 decimal places.

(8 marks)

3. (a) Outline **four** qualities of a good algorithm. (4 marks)

- (b) Explain the role of each of the following header files in a C program:

- (i) `stdio.h;` (2 marks)

- (ii) `math.h.` (2 marks)

- (c) Explain a circumstance under which each of the following Pascal keywords are most appropriate while programming:

- (i) `goto;` (2 marks)

- (ii) `type.` (2 marks)

- (d) In an athletics competitions, athletes were awarded money based on the ranking as shown in Table 2.

Rank	Award (Kshs)
1	1000000
2	500000
3	250000
Any other	0

Table 2

Write a C program that would accept the rank. The program should then determine the award through the use of a function and display the results. Use *if* statement. (8 marks)

4. (a) (i) Outline **two** ways of checking the correctness of a program. (2 marks)
 ✓ *blackbox testing* ✓ *whitebox testing*
- (ii) Describe **two** categories of data that could be used to test a program. (4 marks)
 ✓ *valid data* ✓ *invalid data*
- (b) Explain a circumstance under which each of the following parameter passing methods are most appropriate:
- (i) pass by value; → *it involves passing of the formal arguments* (2 marks)
- (ii) pass by reference. → *instead of passing values, reference are passed* (2 marks)
- (c) Distinguish between *technical* and *user* documentation of a program. (4 marks)
- (d) Write a Pascal program that would accept a positive integer. The program should then determine the square of the number and display the number and its square through the use of a procedure. (6 marks)

5. (a) (i) State **two** operations that can be carried out in a queue data structure. (2 marks)
Add ()
Delete ()
- (ii) Describe a *linked list* as applied in programming. (2 marks)
- (b) (i) State the meaning of each of the following file handling modes:
- I. a → *append a file* ++ 5 (1 mark)
- II. w → *write mode* * 5 (1 mark)
- III. r → *read mode* ++ 5 (1 mark)
- (ii) Given that x is a variable in C program that stores a numeric value, distinguish between x++ and ++x as used in the program operations. (4 marks)
incrementing
- (c) (i) Outline the steps involved in swapping two elements in an array during sorting. (4 marks)
bubble
- (ii) With the aid of an illustration sort the following numbers in ascending order using a selection sort algorithm. (5 marks)
- 8, 4, 6, 12, 3, 2, 5

6. (a) Code reusability is a popular trend used by programmers for quick program development. Outline **four** characteristics of such programs. (4 marks)
- (b) (i) Explain the term *random access* as used in file organization. (2 marks)

(ii) Distinguish between *gets()* and *puts()* as applied in C programming language. (4 marks)

(c) The following is a C program. Use it to answer the question that follows:

```
#include<stdio.h>
int main()
{
    int x,y,z;
    x=3, y=9, z=-5;
    (x<=y)?12:9;
    z=x % y;
    return 0;
}
```

Using a trace table, show the values of x, y and z for the program executions. (4 marks)

(d) A text file named *students.txt* is located D has a list of students. Write a Pascal Program that reads the file and displays the list on the screen. (6 marks)

7. (a) Explain the term *in-built* function as used in C programming. (2 marks)

(b) Distinguish between *a record* and *an array data structure* as used in programming. (4 marks)

(c) (i) Describe *sequential search algorithm* as used in programming. (2 marks)

(ii) Using *binary search* algorithm, illustrate the steps used to search for a value 45 in the following list of numbers. (6 marks)

12 15 18 20 25 30 48 50 75

(d) Write a Pascal program that would display all the odd numbers from 1 to 29 alongside their squares. Use the while loop. (6 marks)

8. (a) State the function of each of the following C escape characters:

(i) $\backslash n$ - next line (1 mark)

(ii) $\backslash t$ - horizontal (1 mark)

(b) (i) Write the general format for declaring a *structure data* type in C programs. (4 marks)

(ii) Explain **two** reasons for using functions in a program. (4 marks)

(c) With the aid of a flowchart, describe a *repeat until* loop as used in Pascal programs. (4 marks)

(d) Write a Pascal program that uses the *for loop* to generate the following output. (6 marks)

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4

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