2920/103
STRUCTURED PROGRAMMING
July 2018
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE I

STRUCTURED PROGRAMMING

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) 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; (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)

(ii) Describe **two** categories of data that could be used to test a program. (4 marks)

(b) Explain a circumstance under which each of the following parameter passing methods are most appropriate:

(i) pass by value; (2 marks)

(ii) pass by reference. (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)

(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 (1 mark)

II. w (1 mark)

III. r (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)

(c) (i) Outline the steps involved in swapping two elements in an array during sorting. (4 marks)

(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) \n (1 mark)

(ii) \t (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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