

2920/103
STRUCTURED PROGRAMMING
July 2011
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE I

STRUCTURED PROGRAMMING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet,

*Answer any **FIVE** of the following **EIGHT** questions.
All questions carry equal marks*

This paper consists of 8 printed pages.

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

- (a) (i) Outline **three** advantages of structured programming paradigm. (3 marks)
- (ii) Differentiate between 1st and 4th generations of programming languages. (4 marks)
- (b) Distinguish between *top-down* and *bottom-up* program design concepts. (4 marks)
- (c) Figure 1 shows a flow chart created by a student during a programming lesson.

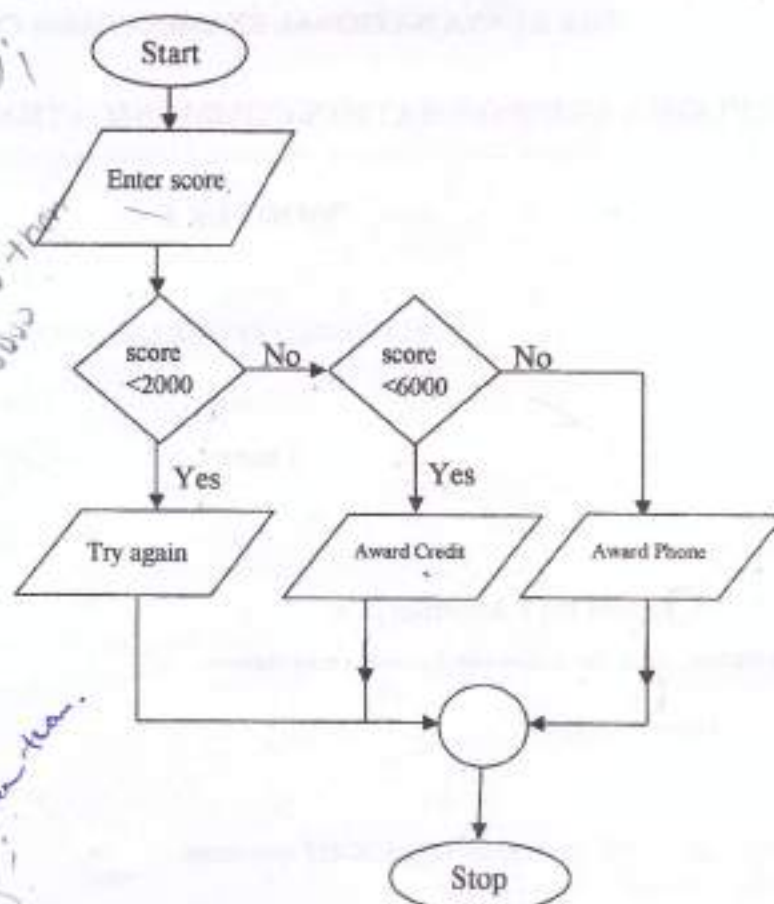


Figure 1

Write a C program that would implement the program logic. Use *if-else* structure. (7 marks)

- (d) State the *type of error* in each of the following programming scenarios:
- (i) endless loop;
- (ii) *use of opening double quotes without corresponding closing quotes.* (2 marks)

2. (a) (i) State the *format specifiers* for each of the following types of data as applied in C programming.

Type of data	Format specifier
Floating point number	F
Single character	C
String of characters	S
Machine memory address	

(2 marks)

- (ii) With the aid of an example in each case, distinguish between *logical* and *arithmetic* operators as applied in C programming. (4 marks)

- (b) Study the following C program and then answer the question that follows.

```
#include< stdio.h>
int main ( )
{
    int number1, number2;
    float decimal;
    char letter;
    decimal = 13.5 ;
    letter='D';
    number1 = (int) decimal;
    number2 = (int) letter;
    printf ("Number 1: is %d\n", number1);
    printf ("Number 2 is : %d\n", number2);
    return 0;
}
```

Note: The ASCII equivalent of A=65, B=66, C=67 etc

Write the output produced when the program is executed. (4 marks)

- (c) Write a Pascal program that would store the six *integers* from 10 to 15 in an array. The program then outputs the integers in the reverse order of entry. Use a *for-do* loop. (5 marks)

- (d) Study the following C program and then answer the question that follows.

```
# include <stdio.h>
int main ( )
{
    enum colours
    { RED =1, YELLOW, GREEN, BROWN, BLUE, PINK,
      BLACK};
    int total;
    printf (" I won a green card worth%d\n",GREEN);
    printf ( " Then a black one worth %d\n",BLACK);
    total = GREEN + BLACK +BLUE;
    printf ( "Finalscore I managed %dmarks",total);
    return 0;
}
```

Write the output produced when the program is executed. (5 marks)

3. (a) Explain the function of each of the following *key words* as used in C programs:

- (i) continue;
- (ii) break. (4 marks)

- (b) Table 1 shows details of athletes rating based on nationality. Use it to answer the question that follows.

COUNTRY	CODE	RATING
Kenya	K or k	Highly talented sportsmen
India	I or i	Sporting affected by their culture
United states	U or u	Good in short races
Nigeria	N or n	Give a good attempt in short races
All other countries	Any other	General performance is low

Table 1

Write a C program that would prompt a user to enter his/her country code. The program then outputs an appropriate rating depending on the code entered. Use the *switch* statement. (6 marks)

- (c) (i) Distinguish between *write* and *writeln* statements as used in Pascal programming language. (2 marks)

- (ii) Study the following Pascal program and then answer the questions that follow.

```

Program cases;
var
    letter: char;
    response: char;
begin
    repeat
        write ('Enter a character: ');
        readln (letter);
        if (letter >= 'a') AND (letter <= 'z')
        then
            letter := chr (ord (letter) - 32);
            Writeln ('you entered ; character');
            Write ('enter another time? (Y/N)');
            Readln (response);
            Until ( response = 'N') OR (response= 'n')
    End.

```

- I. Identify **three** errors in the program.
- II. Explain the function of the 11th line. (4 marks)

- (d) Write a Pascal program that would generate the following output on the screen. Use a *for* loop.

```

2 4 6 8
2 4 6
2 4
2

```

(4 marks)

4. (a) Describe each of the following data structures:

- (i) Queue;
- (ii) Tree;
- (iii) Linked list.

(6 marks)

- (b) The ASCII character set can be divided into *control characters* (from 0 to 31), *space* (32), *digits* (33 to 64), *letters* (65 to 116) and the rest as *symbols*. Write a Pascal program that would prompt a user to enter a number representing a character. The program should then output its category through the use of a *procedure*. Use the *case* statement. (6 marks)

- (c) Table 2 shows some elements in an array.

12	89	2	105	23	8	77
----	----	---	-----	----	---	----

Table 2

Write a C program that would sort the array in descending order. The program should then output the sorted list. Use *selection* sort technique. (8 marks)

(a) Distinguish between *insertion* sort and *merge* sort techniques as used in programming. (4 marks)

(b) Describe each of the following variables as used in programming:

- (i) global;
- (ii) local. (4 marks)

(c) Table 3 shows an array containing five elements.

22	36	27	96	14
----	----	----	----	----

Table 3

Write a C program that would search for any element using linear search technique and then output an appropriate message. (7 marks)

(d) Write a Pascal program that prompts a user to enter two real numbers. The program should then compute their product through the use of a function and output the result through the use of a procedure. (5 marks)

(a) (i) Explain the term *dereferencing a pointer* as applied in programming. (1 mark)

(ii) Explain the use of each of the following functions in Pascal programs:

- I. `abs()` - absolute
- II. `sqr()` - find the square. (2 marks)

(b) (i) Outline three advantages of using *pointers* in a program. (3 marks)

(ii) Table 4 shows an array containing five elements.

4	6	7	5	2
---	---	---	---	---

Table 4

Write a C program that would vertically output the elements on the screen through the use of pointers. (5 marks)

(c) State the circumstance under which each of the following *file modes* are used in C programs:

- (i) `w` - write to a file
- (ii) `a` - append a file / open - file ready to read/write
- (iii) `r+` - (3 marks)

- (d) Study the following C program segment and then answer the question that follow.

```
int x[5] = {6, 8, 4, 3, 11};
int *p; p=x;
p++; printf("\n%d", *p);
p++; printf("\n%d", *p);
p--; printf("\n%d", *p);
printf("\n%d", *(p+2));
printf("\n%d", *(p+3));
p--; printf("\n%d", *p);
```

*p++; printf("\n%d", *p);*
*printf("\n%d", *p);*
*p--; printf("\n%d", *p);*
7.9

Write the output produced when the code is executed.

(6 marks)

- (a) State **three** uses of program documentation.

(3 marks)

- (b) Explain **one** advantage and **one** disadvantage of indexed file organization method.

(4 marks)

- (i) Outline **one** way of incorporating a block of comments in each of the following programming languages:

I. Pascal;

II. C

(2 marks)

- (ii) Explain **two** challenges of the emerging trends in programming.

(4 marks)

- (d) Write a C program that would open a file named module1.txt stored in drive C and then write characters m, n and p into the file using the putc() function.

(7 marks)

- (a) Distinguish between reset and assign file commands as applied in Pascal programming language.

(4 marks)

- (b) A hospital consists of 20 doctors whose name, age, sex and salary need to be stored in a computer. Using Pascal programming language, declare a structure that could be used to store the details of all the 20 doctors.

(4 marks)

- (c) (i) Distinguish between value and variable parameters in terms of implementation in Pascal programs.

(2 marks)

- (ii) Write a Pascal program that would be able to add integers from 1 to 10 and output the total. Use while loop.

(4 marks)

while i:=1 to 10 do
sum:=i+1;
Program Numbers;
Var
Hi: Integer;
Begin

Numbers
Numb: Array[1..10] of Integer;

- (d) Table 5 shows the details of tax relief as determined by a certain tax firm. Use it to answer the question that follows.

Category	Category name	Amount insured	Tax relief on taxable income
1	Casual	At least 1,00,000	5%
2	Contract	At least 2,00,000	10%
3	Termly	At least 2,00,000	12%
4	Permanent	At least 1,00,000	20%
5	Other		0%

Table 5

The firm intends to computerize the process of determining the tax relief. Write a pseudocode that would be used by a programmer to meet the firm's requirement. (6 marks)

Name
 Type
 Salary
 Param Array
 Var
 Doc: Array[1..20]
 Type Docx[1..20]
 Name: String; Doc: I;
 age: Integer; I;
 sex: String;
 salary: Integer;

Case 1
 (Capital)
 Case IF casual at least 100,000 then
 (Capital) 5% tax relief
 Case IF contract at least 2,000,000
 (Capital) 10% tax relief
 Case Termly at least 2,000,000
 (Capital) 12% tax relief
 Case Permanent. At least 1,000,000
 20%
 else (Capital)

Program doctor;
 Type doctor = record
 var name: doctor;