

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.

#include <stdio.h>
 main()
 {
 int score;
 printf("Enter the score");
 if (score < 2000)
 {
 printf("Try again");
 }
 else if (score < 6000)
 {
 printf("Award Credit");
 }
 else
 {
 printf("Award Phone");
 }
 }

IF score < 2000 then
 Print("Try again");
 ELSE
 IF score < 6000 then
 'YES' := Award Credit;
 'NO' := Award Phone;
 Print("Award Credit");

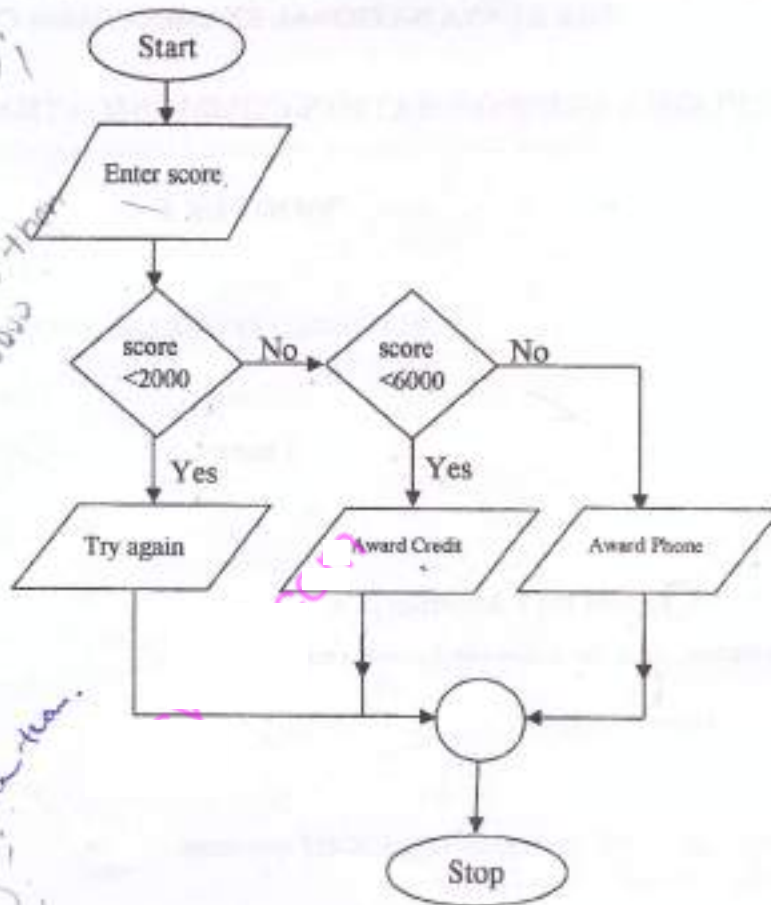


Figure 1

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)

Compile -
 Logical -
 Runtime

Syntax -
 Logical -
 Runtime -
 Lexical -

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 Do you want to continue
    write ('Enter a character: ');
    read/n (letter);
    if (letter >= 'a') AND (letter <= 'z')
    then
        letter := chr (ord (letter) - 32);
        Writeln ('you entered ; character');
        Write ('enter another time? (Y/N)');
        Read/n (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. (a) Describe each of the following data structures: (4 marks)
- (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)

```
#include <stdio.h>
main()
{
    int x[5];
    // ...
}
```

(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)

(6) (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() - 0
- II. sqr() - 1 (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)

```
#include <stdio.h>
main()
{
    int a, b, c, d, e;
    printf("Enter the values of a, b, c, d, e:");
}
```

```
int a[5] = {4, 6, 7, 5, 2};
int *p;
p = a;
p++;
// ...
begin
p: A integer;
end.
```

```
i * p('a, b, c, d, e');
```


- (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)

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

- i. Pascal; (2 marks)
- ii. C

- (d) 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)

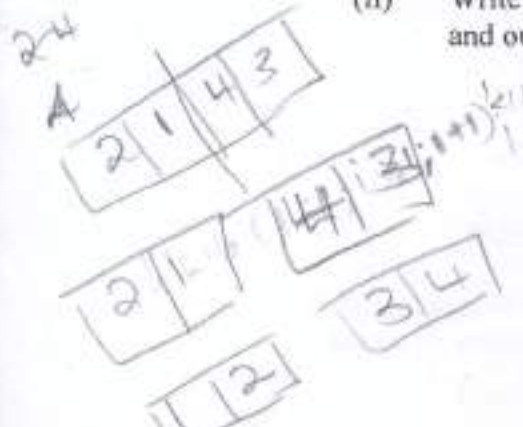
- (b) A hospital consists of 20 doctors whose name, age, sex and salary need to be stored in a computer. Using Pascal programming language, declare a structure that could be used to store the details of all the 20 doctors. (4 marks)

- (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)

7.
 - Enables programmers to work well with other programmers.
 - Enables to understand the program well.
 - Enables guidelines to be followed by the programmer who might be going to change the code.

```
p = fopen("C:\module1.txt", "w");  
putc('m', p);  
putc('n', p);  
putc('p', p);
```



```
begin i := 1 to 10 do; Program Numbers;  

    sum := i + 1;  

end i;  

    Numb: Array[1..10] of integer;  

    Begin;
```

(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 1,000,000	5%
2	Contract	At least 2,000,000	10%
3	Termly	At least 2,000,000	12%
4	Permanent	At least 1,000,000	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)

Handwritten pseudocode and notes:

```

- name
- sex
- salary.
Param Array
Var Doc: Array [1..20]
Type Docx [1..20]
    Name: string [10];
    age: integer [1..100];
    sex: string;
    Salary: integer;
    Program Amount;
    Type: boolean;
    var name id: char [20];

Case Statement
(Person)
    Case 1
        (Capital)
        Case IF casual At least 1,000,000 then
            5% tax relief
        Case
            (Capital)
            at least 2,000,000
            10%
        Case
            (Capital)
            at least 2,000,000
            12%
        Case
            (Capital)
            at least 1,000,000
            20%
        else (Capital)
            0%
    Other
        integer 0%
    
```