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.

4. (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.

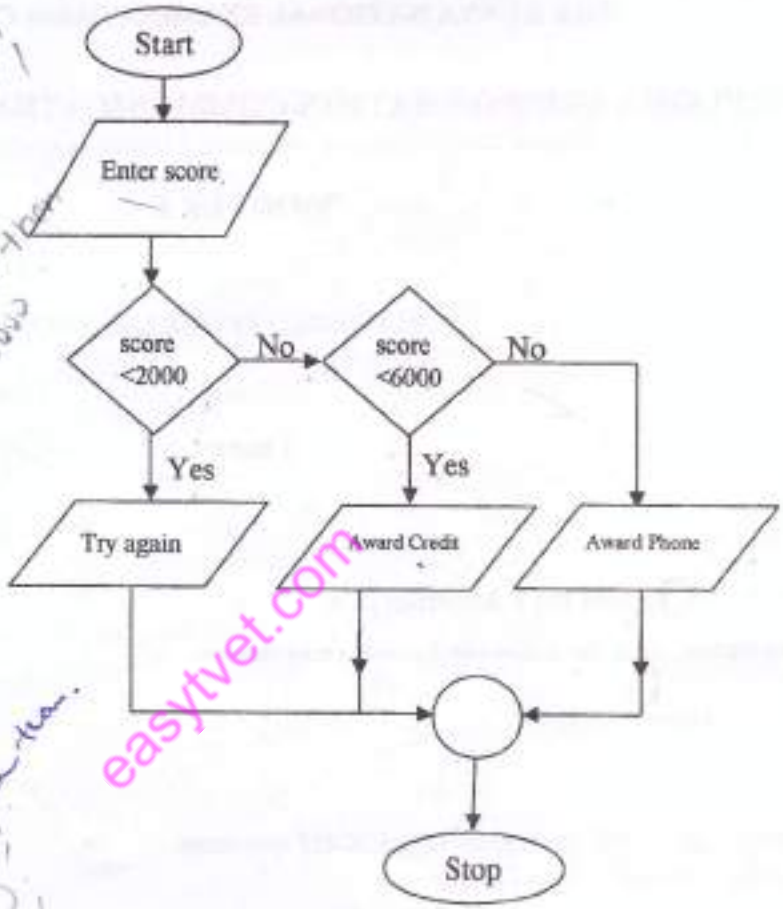

Figure 1

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	
Single character	
String of characters	
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: ');
     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 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)

15. (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)

16. (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()

II. sqr() (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 –

(ii) a –

(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);
```

Write the output produced when the code is executed. (6 marks)

7. (a) State **three** uses of program documentation. (3 marks)

(b) Explain **one** advantage and **one** disadvantage of *indexed file organization method*. (4 marks)

(c) (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.text* stored in drive C and then write characters m, n and p into the file using the *putc( )* function. (7 marks)

8. (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)

(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 1000000	5%
2	Contract	At least 2000000	10%
3	Termly	At least 2000000	12%
4	Permanent	At least 1000000	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)