2920/103
STRUCTURED PROGRAMMING
November 2016
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.*
All questions carry equal marks.
Candidates should answer the questions in English.

This paper consists of 5 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) State **two** programming paradigms giving an example of a programming language in each case. (4 marks)

   (b) Differentiate between *structured* and *user defined* data types as used in C programming language. (4 marks)

   (c) Explain each of the following stages used when solving a problem through computer programming. (6 marks)

   (i) Problem definition;

   (ii) Writing the algorithm;

   (iii) Testing the solution.

   (d) Write a C program that prompts a user to enter three integers and displays the largest of them. Use *if ... else* control structure. (6 marks)

2. (a) Explain **two** ways through which parameters can be passed to a function. (4 marks)

   (b) With the aid of an example in each case, distinguish between *relational* and *logical* operators as used in structured programming. (4 marks)

   (c) Describe each of the following data structures as used in programming. (4 marks)

   (i) Linked List;

   (ii) Array.

   (d) Table 1 shows a criteria used by a supermarket to award discounts to the customers based on the amount spent.

Amount Spent (Kshs)	Discount Rate
10000 – 14999	10%
15000 – 24999	15%
25000 – 29999	20%
30000 and over	25%

   Table 1

   Write a C program that prompts a user for the amount spent. The program should use a function to calculate and display the net amount paid by the customer. (8 marks)

   Hint: Net amount=Amount spent – (Discount Rate × Amount spent)

3. (a) Outline the function of each of the following string functions as used in Pascal programming language : (2 marks)

   (i) SetLength;

   (ii) Str.

   (b) Distinguish between a *flowchart* and a *pseudocode* as used in programming. (4 marks)

   (c) Write a pseudocode that could be used to calculate the product of all numbers from 1 to 15. (6 marks)

(d) The following details captured about a student are needed to be stored in a text file called *StudentFile* located in drive C of a hard disk:

Full Names, Registration Number, Class

The details are expected to be stored in a columnar format with the headings as shown below:

Full Names   Registration Number Class

Write a Pascal program to prompt a user to enter the details of **ten** students and store them in the file. Use a *record* data type. (8 marks)

4. (a) Outline **four** application areas of the queue data structure. (4 marks)

(b) Distinguish between *compilation* and *debugging* as used in programming. (4 marks)

(c) Below is a C program with errors. Use it to answer the question that follows:

```
#include <stdio.h>
int main(){
int x,y;
printf("enter a value");
scanf("%d", x);
if(x == 5)
        {
        y= pow(5,2);
        printf("The answer is  ", y);
        }
else
        {
        printf("You did not enter value 5");
        }
return 0;
}
```

Rewrite the correct program. (4 marks)

(d) Given the following list of numbers:
    45, 23, 4, 15, 78, 52, 12, 6, 56

Show step by step process of sorting the list using bubble sort technique. (8 marks)

5. (a) Differentiate between a *local variable* and a *global variable* as used in programming. (4 marks)

(b) Explain **two** advantages of the linked list data structure. (4 marks)

(c) A student has declared two integer variables x and y. At declaration, he has initialized the value of x to be 40 and the value of y to be 50. Using pointers, write a C program that can be used to change the value of these variables to 55 and 60 respectively. (4 marks)

(d) A university admits students into various courses based on their gender and mean grade scored as shown in Table 2. Use it to answer the question that follow.
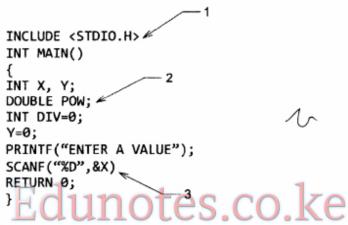
COURSE	GENDER	MEAN GRADE
Law	Male	A
	Female	B+
Education	Male	B+
	Female	B

Table 2

Draw a flowchart that can be used to implement the logic that would ensure that the students are admitted to the right courses and display the total number of students.

(8 marks)

6. (a) Below is a C program with errors in lines labelled 1, 2 and 3. Use it to answer the question that follow:

```
INCLUDE <STDIO.H>          1
INT MAIN()
{
INT X, Y;                  2
DOUBLE POW;
INT DIV=0;
Y=0;
PRINTF("ENTER A VALUE");
SCANF("%D",&X)
RETURN 0;
}                          3
```

Explain the types of errors that could be generated from lines 1, 2 and 3 when the program is executed. (6 marks)

(b) Outline **four** reasons why program documentation should be done during program development. (4 marks)

(c) With the aid of syntax statements in each case, distinguish between the *do...while* loop and the *while* loop as used in programming. (4 marks)

(d) Write a Pascal program that creates a record data structure and uses it to prompt a user to enter the following details about an employee. (6 marks)

Name, Gender, Age, Salary

7. (a) Explain **two** ways in which records can be organized in a computer file. (4 marks)

(b) Describe each of the following types of files generated during program development and compilation: (4 marks)

(i) Source File;

(ii) Object File.

(c) Write a Pascal program that prompts a user to enter two integer values and divides the first by the second. Provide an error handler to display the text *"Do not enter the value zero as a second value"* if the second value is zero. Use *goto* statement. (6 marks)

(d)   Write a Pascal program that prompts a user to enter the value of radius and uses it to calculate the area of a circle. Initialize constant pie to 3.142   (6 marks)

8.   (a)   Outline **four** rules to be observed when choosing variable names.   (4 marks)

(b)   Explain **two** circumstances under which top-down program design would be recommended in program development.   (4 marks)

(c)   Differentiate between *declared constants* and *defined constants* as used in C programming.   (4 marks)

(d)   Write the output from the following C program.   (8 marks)

```c
#include <stdio.h>
int main()
{
  int i;
  for (i=1; i<=10; i++)
          {
          if (((i%2)==0))
          {
          printf("%d",i);
      printf(" squared is %d \n", (i*i));
          }
          else
          {
          printf("%d", i);
printf("is an odd number \n");
}
}
return 0;
}
```

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