2920/103
STRUCTURED PROGRAMMING
July 2016
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE I

STRUCTURED PROGRAMMING

3 hours

INSTRUCTIONS TO CANDIDATES

*Answer any **FIVE** of the following **EIGHT** questions in the answer booklet provided.*
***ALL** questions carry equal marks.*
Candidates should answer the questions in English.

This paper consists of 6 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) (i) Outline **two** circumstances that would make a programmer to use structured programming language when writing a program. (2 marks)

      (ii) Explain the term *procedural programming*. (2 marks)

   (b) Janet, a computer programmer intends to create a program using C programming language. State the program development stage in which she could:

      (i) create flow charts;

      (ii) choose the identifiers;

      (iii) check whether the program is giving the desired results;

      (iv) adjust the program to meet new demands. (4 marks)

   (c) During a programming lesson, a student was required to sort data in an array using bubble sort technique.

      (i) Write a pseudocode that the student could use to achieve this. (4 marks)

      (ii) Convert the pseudocode in (i) into a flow chart. (4 marks)

   (d) (i) Peter, a programmer wrote a program using Pascal programming language. Outline **four** elements that he is likely to include in the declaration part. (2 marks)

      (ii) Assuming Pascal programming language, evaluate the expression:
      $Y = a + b * c^2 - (d / e)$. (2 marks)

2. (a) (i) Outline **two** circumstances that may cause a run time error to occur in a program. (2 marks)

      (ii) Explain **two** techniques that may be used to prevent a program from unexpected termination. (4 marks)

   (b) Write a Pascal program that would prompt a user to enter weight of five people and store the values in an array. The program then computes and output the total weight. (6 marks)

   (c) Table 1 shows the criteria used by a certain college to award grades to students in an examination. Use it to answer the question that follows:

Range of Marks	Grade
From 70 to 100	A
From 60 to 69	B
From 50 to 59	C
From 40 to 49	D
Less than 39	F

Table 1

Write a C program that would prompt a user the grade obtained by a student. The program should then output the range of marks. Use *if statement*. (4 marks)

   (d) Distinguish between *pass by value* and *pass by reference* as used in programming. (4 marks)

3. (a) (i) Define the term *efficiency* as used in data structures. (2 marks)

   (ii) Explain each of the following approaches used in programming.
       I. top-down (2 marks)
       II. bottom-up (2 marks)

   (b) Write a C program to compute the sum of even integers from 20 to 95. (5 marks)

   (c) Write a Pascal program that prompts a user to enter numeric values into n by m array. The program should then compute and output the sum of the products of the respective elements in the array. (5 marks)

   (d) Distinguish between *tree* and *graph* as used in data structures. (4 marks)

4. (a) (i) Explain the term *dry run* as used in programming. (2 marks)

   (ii) Distinguish between *alpha* and *beta* tests as used in programming. (4 marks)

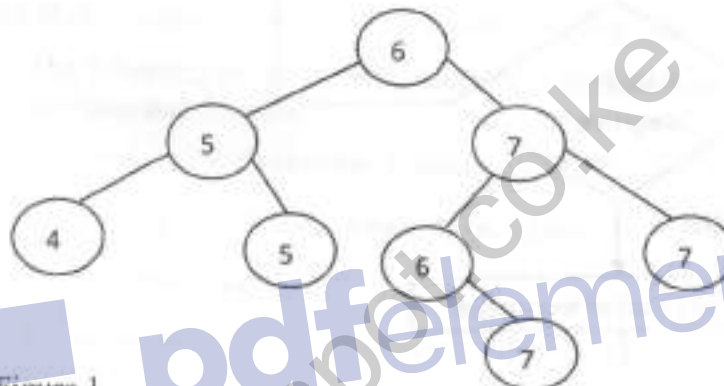   (b) Figure 1 shows a binary tree structure. Use it to answer the questions that follow.

   Figure 1

   (i) Identify all the leaf nodes of the tree; (2 marks)

   (ii) Write the output generated when the tree is traversed using *postorder* strategy. (2 marks)

   (iii) Explain the effect of removing the node labeled 68. (2 marks)

   (c) Write a C program that could create a text file named *Myfile*. The program should then store the string value *name* in the file. (6 marks)

   (d) Outline **two** circumstances under which a programmer would prefer to use an interpreter when translating a program. (2 marks)

5. (a) (i) Outline **two** ways that would improve the readability of a program. (2 marks)

   (ii) A student created a data structure in his program. Explain **two** reasons that could have necessitated this. (4 marks)

   (b) (i) Explain the term *stepwise refinement* as used in programming. (2 marks)

(ii) Two programmers shared the work of creating a program amongst themselves.

    I.   Identify the programming approach that they are using (1 mark)

    II.   Outline **three** advantages of this approach. (3 marks)

(c) Write the general syntax for the *case* statement in Pascal programming language.
    (2 marks)

(d) Figure 2 shows a program flowchart used to solve a mathematical problem. Use it to answer the question that follows.
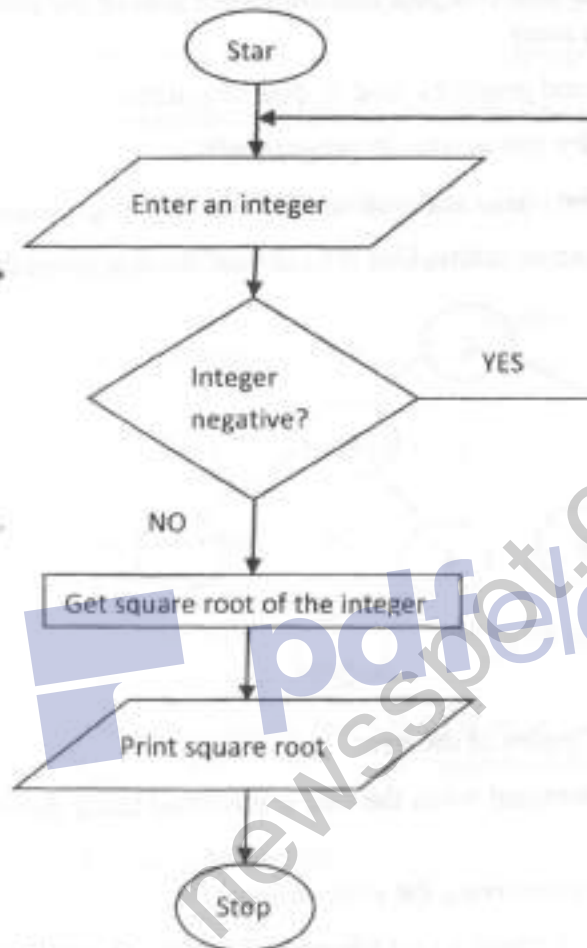

Figure 2

Write a C program to implement the program logic in the flowchart. (6 marks)

6.   (a)   (i)   Outline **two** advantages of machine language. (2 marks)

    (ii)   John, a programmer at Waka Computer Solutions created a program using unstructured programming language. Outline **four** challenges that he may have encountered. (4 marks)

(b) Table 2 shows the criteria used by a certain college to admit applicants to various course levels. Use it to answer the question that follows.

KCSE Grade	Course level
A or B	Degree course
C	Diploma course
D	Certificate course
Any other	Artisan course

Table 2

Write a Pascal program that prompts a user to enter the grade obtained. The program should then output the course level the applicant is qualified to join. Use *case* statement. (6 marks)

(c) Using Pascal programming language, declare a record named *student* to hold the fields: *registrationnumber, name, Gender(M/F)* and *age*. (4 marks)

(d) Distinguish between *formal* and *actual* parameters as used in programming. (4 marks)

7. (a) Outline **three** advantages of using functions in a program. (3 marks)

(b) (i) The following program was created by a student. Use it to answer the question that follows.

```
Program Take_Beverage (input, output);
type
Beverage = (coffee, tea, coke, juice);
var
Drink: Beverage;
begin
Writeln('Which drink would like to take?');
Drink:= juice;
Writeln('Welcome to take your ', Drink);
end.
```

Trace the program. (3 marks)

(ii) Write a Pascal program to prompt a user to enter a score and grade in a subject. The program then displays the score and grade in single line. Scores range between 1 and 100 and grade ranges between A and E. (4 marks)

(c) (i) Explain the term *overflow error* as used in data structures. (2 marks)

(ii) When a student was compiling a program he had created, an error message "*type mismatch*" was displayed. Identify a possible reason for this error. (2 marks)

(d) Write a C program that would prompt a user to enter a string. The program then returns the number of characters in the string. (6 marks)

8. (a) (i) Define a *record* as used in structured programming. (2 marks)

(ii) Explain **two** ways used to reference fields in a Pascal record. (4 marks)

(b)   Write an algorithm using structured English that could be used to implement linear search. (4 marks)

(c)   Distinguish between *stack* and *queue* data structures with respect to the operation of removing an element. (4 marks)

(d)   Write a C program to prompt a user to enter two integer values that are not equal. The program then subtracts the smaller value form the larger and displays the larger integer and their difference. (6 marks)

THIS IS THE LAST PRINTED PAGE.