

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.**

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**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.

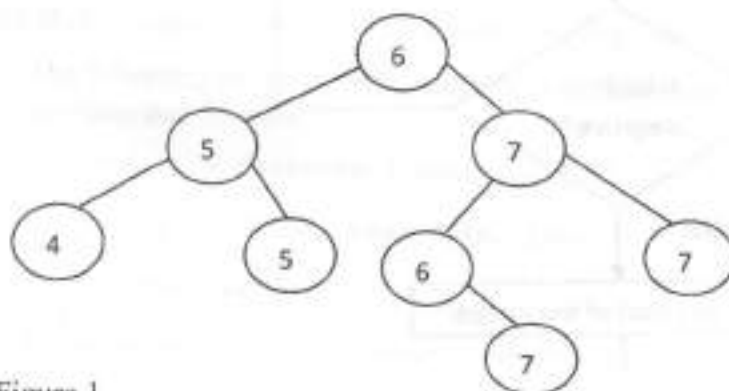


Figure 1

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

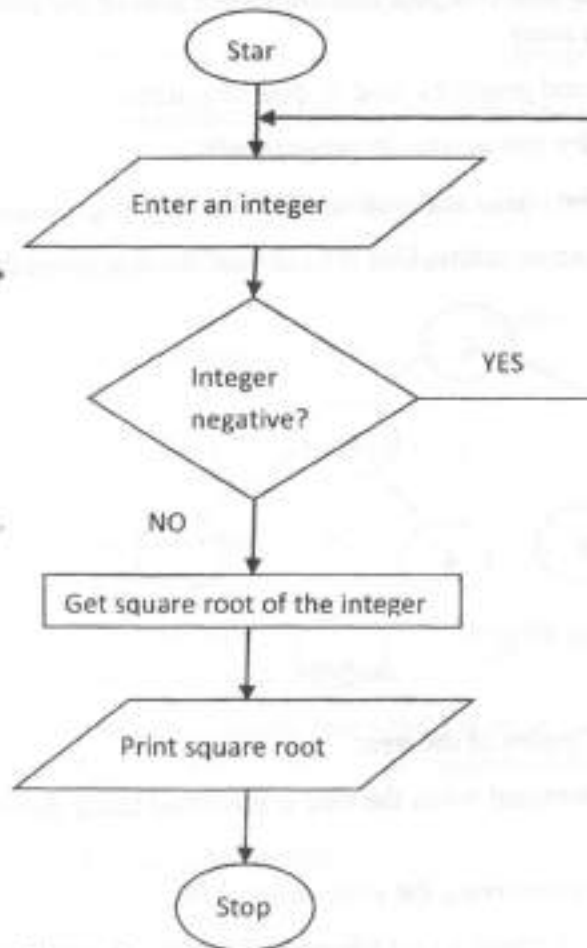


Figure 2

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 from the larger and displays the larger integer and their difference. (6 marks)

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