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: $Y = a + b * c \wedge 2 - (d / e)$. (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.

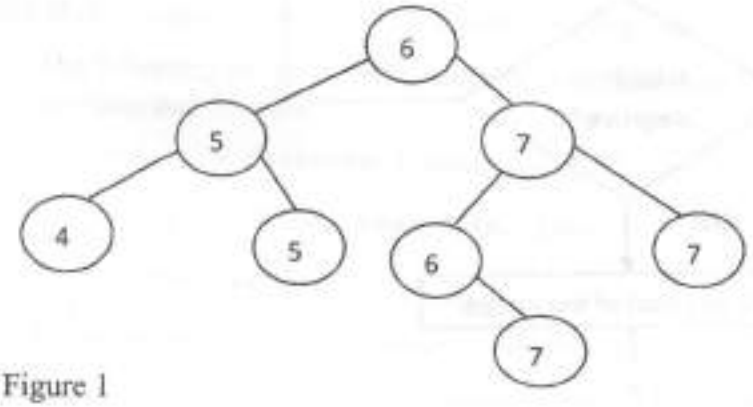

Figure 1

(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.

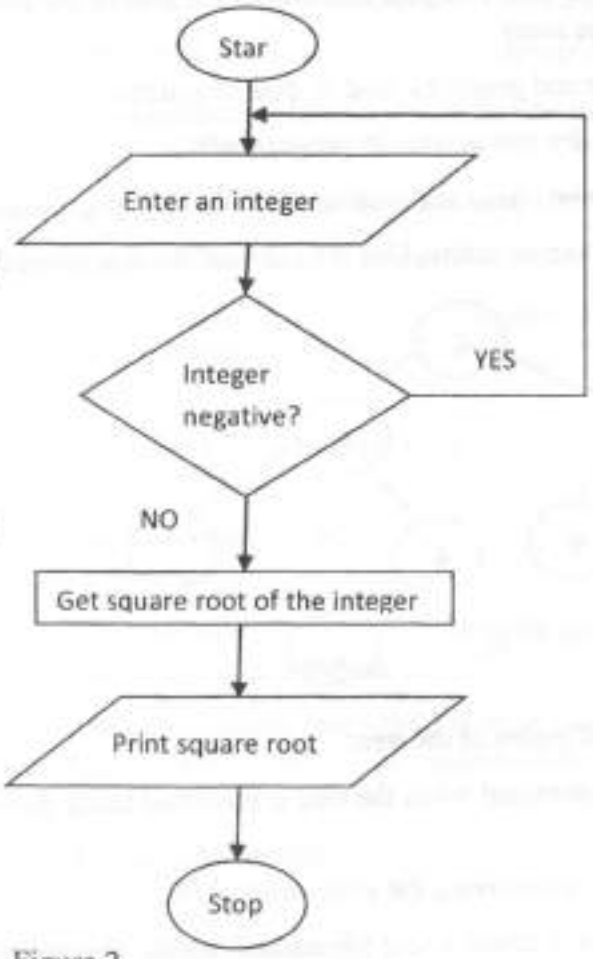

Figure 2

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)

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