

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

JUNE 2016

ADVANCED LEVEL

Subject Title	Computer Science
Paper No.	2
Subject Code No.	0795

Two Hours

Answer any SIX questions.

All questions carry 17 marks each. For your guidance, the approximate mark for each part of a question is indicated in brackets.

You are reminded of the necessity for good English and orderly presentation in your answers.

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

1. (i) (a) Identify the main components of the Von Neumann Computer model and state their roles. (4,1,1,1 marks)
 (b) Which two registers are needed in the communication between the main memory and the processing unit? (2 marks)
- (ii) From the truth table below:
 (a) Construct the corresponding logic gate. (4 marks)
 (b) Deduce the Boolean expressions for the sum and remainder. (4 marks)

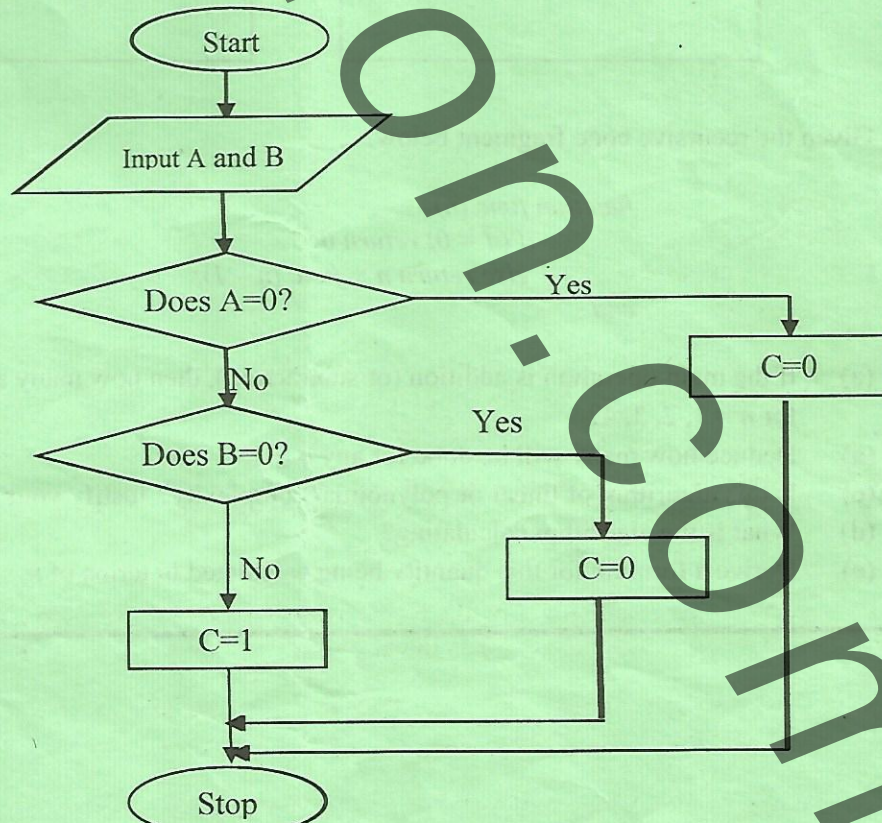
A	B	Sum	Remainder
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

2. (i) The figure below shows the contents of a memory location

1	0	1	0	0	1	1	1
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- (a) What is the denary equivalent of the contents of this memory location if it represents an **unsigned binary digit**? (2 marks)
 (b) What is the denary equivalent of the contents of this memory location if it represents an **unsigned binary fixed point number**, with 4 bits before and four bits after the binary point? (2 marks)
 (c) What is the denary equivalent of the contents of this memory location if it represents a **two's complement binary integer**? (2 marks)
 (d) What is the hexadecimal equivalent of the binary pattern shown in the figure above? (2 marks)
- (ii) (a) Briefly explain the following, giving one practical application of each: PROM, EEPROM, RAM (6 marks)
 (b) As far as computer organization is concerned, explain briefly what is meant by address mapping. (1 mark)
 (c) What is cache memory? (2 marks)
3. (i) What is a database? (3 marks)
 (ii) Define the following terms as far as databases are concerned:
 (a) primary key,
 (b) candidate key and
 (c) attribute. (3 marks)
- (iii) ELECAM wants to computerize electoral registers such that a voter can be registered in just one polling station in Cameroon. A voter must not be less than 20 years old. In a voting exercise a voter may cast his vote for at most one party, only in one polling station (where he or she is registered) and only once.
 (a) In the above description, bring out three entities involved and two relations. (8 marks)
 (b) Which statement in the description is an integrity constraint on the voter? (1 mark)
 (c) Which 2 phrases are cardinality constraints? (2 marks)
4. (i) (a) Differentiate between a program branch and a subroutine call. (3 marks)
 (b) What is assembly language? Suggest TWO possible advantages of programming in an assembly language rather than in high level languages. (3 marks)
- (ii) (a) What do you understand by the terms height of a binary tree and a complete binary tree? (2 marks)
 (b) Why are queues considered as linear data structures? (2 marks)
- (iii) (a) Binary search is a recursive algorithm. Describe the basic operations of a binary search algorithm for a table sorted in ascending order. (4marks)
 (b) What should change in the algorithm if the table were sorted in the reverse order. (2 marks)

5. (i) A school has expanded rapidly. A systems analyst is employed to plan the introduction of a computer system which will store student records and details of students marks. For three distinct areas, describe what the systems analyst should report on during the feasibility study. (6 marks)
- (ii) Describe TWO methods that the systems analyst could use in order to collect information about the current system being used in the school. For each method, give a suitable example to illustrate your answer. (6 marks)
- (iii) The systems analyst must decide between a solution that uses *custom-written* software and one that use *off-the-shelf* software.
- (a) Explain what is meant by the terms custom-written and off-the-shelf software. (5 marks)
- (b) Identify custom-written software that the school above may need, and justify why it would need it. (3 marks)
6. (i) Computer technology has seen a lot of development in the recent years. In particular, several semiconductor manufacturers have introduced dual core processors.
- (a) Explain what a dual-core processor is. (2 marks)
- (b) Describe how dual-core processors have improved processing capabilities. (2 marks)
- (ii) A digital computer is said to have a memory hierarchy.
- (a) Explain why such a memory hierarchy exists. (2 marks)
- (b) Draw a diagram to represent the memory hierarchy you might expect to find in a typical high-performance personal computer. (3 marks)
- (c) An assembly language instruction may use one of several addressing modes to specify the operand. Explain the meaning of the term addressing mode and explain TWO distinct types of addressing modes. (4 marks)
- (iii) Describe in terms of named addressing modes how data found in a given memory location (D), pointed to from another memory location (P) can be loaded into an accumulator. (4 marks)
7. (i) (a) Explain the following object-oriented modelling concepts, using examples to illustrate your answer; Inheritance, and Association class. (4 marks)
- (b) What is the difference between an object in an object oriented language and a variable in a structured programming language? (2 marks)
- (ii) (a) Name and briefly describe three ways in which an analyst could gather information about an existing manual system. (6 marks)
- (b) The flowchart below describes the logic of an AND gate where the values of A and B are binary digits.



Use the same analogy to draw a flowchart for the OR gate

(5 marks)

Turn Over

8. (i) (a) Briefly describe four conditions that are necessary and sufficient for a Deadlock to occur in multi-process application. (8 marks)
- (b) Briefly state why all four conditions are necessary. (1 mark)
- (ii) CPU burst time is the time a process needs the CPU. The following is a set of processes with their corresponding CPU burst times (in milliseconds). Given that the processes arrive in the following order: P2, P3, P1.

Processes	Burst times
P1	10
P2	7
P3	5

- (a) Draw Gantt charts for “round robin” and for “shortest remaining job next” scheduling algorithms using with time quantum of 3 milliseconds. (2 marks)
- (b) Calculate the average turnaround time for the processes in each case. (4 marks)
- (c) According to your results in (c), which of the algorithms would you choose for this situation? Justify your answer. (2 marks)
9. (i) Distinguish between syntax and semantic errors as used in programming. (2 marks)
- (ii) Consider the codes fragments (A) and (B) below. There is an error in one of them. Each intends to calculate the square root ($\text{sqrt}(r)$) of a number (x). How does the other correct this error? (3 marks)

(A)

```

x, r : Real;
write ("Enter x");
read (x);
r ← sqrt(x);

```

(B)

```

x, r : Real;
write ("Enter x");
read (x);
If (x < 0) write ("impossible");
Else r ← Sqrt (x);

```

- (iii) Given the recursive code fragment below:

```

function func (n)
    if (n = 0) return 0
    else return n + func (n - 1);
end

```

- (a) If the main operation is addition (or subtraction), then how many additions can be made for $n = 1, 2, 3, 4$? (3 marks)
- (a) Deduce how many will be done for any $n \geq 1$. (3 marks)
- (c) Is this algorithm of linear or polynomial complexity? Justify your answer. (2 marks)
- (d) What is the algorithm calculating? (1 mark)
- (e) Derive a formula for this quantity being calculated in terms of n . (3 marks)