Sir Aboutes

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD
General Certificate of Education Examination

JUNE 2010 **ADVANCED LEVEL**

Subject Title	Computer Science
Paper No.	Paper 2
Subject Code No.	795

Two hours

Answer any SIX questions.

All questions carry 20 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.

Non-Programmable, noiseless and cordless electronic calculators may be used.

1. (i) Define the term computer hardware. Give THREE examples **(4 marks)**

(ii) You have recently acquired a second-hand PC from a friend and immediately decided to upgrade some of its internal components.

(a) Name any THREE of the internal components. **(3 marks)**
(b) Explain ONE benefit to be derived from the upgrade of each of the components named above. **(3 marks)**
(c) State TWO safety precautions which should be observed during the upgrade. **(2 marks)**

(iii)

(a) State the meaning of each of the following in the context of data transmission: Full duplex, half duplex and simplex transmissions. **(3 marks)**
(b) Give an example of the use of each concept in (iii)a **(3 marks)**
(c) Distinguish between synchronous and asynchronous transmissions. **(2 marks)**

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2. (i) (a) Select an enterprise of your choice, such as a school, hospital, or brewery company. Give THREE reasons why a poorly conceived information system can affect productivity in various sectors of the enterprise. **(3 marks)**

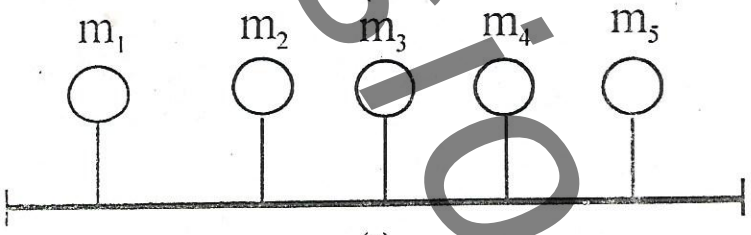
(b) Differentiate between data and information. **(2 marks)**

(c) State as precisely as possible the role of each of the following in an information system.

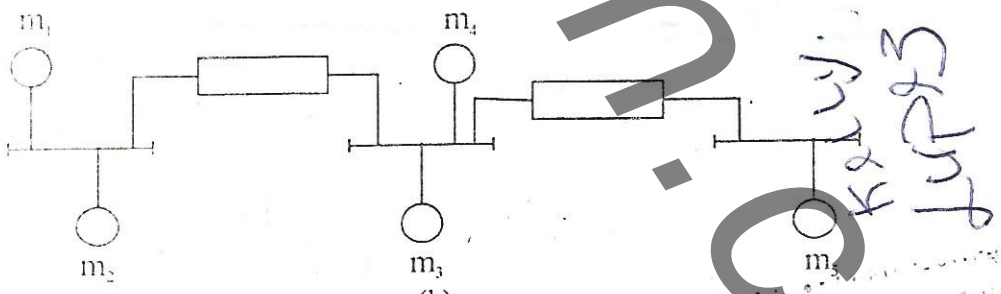
- people
- procedures
- hardware
- connectivity

(8 marks)

(ii)



(a)



(b)

(a) Differentiate between the bus networks in figures (a) and (b) in terms of accuracy of transmission and cost of installation. **(2 marks)**
(b) What is the major reason for these differences? **(2 marks)**
(c) What topology is used in the two cases above? **(1 mark)**

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3. (i) (a) Give four differences between a system software and an application software? **(4 marks)**
(b) What makes an anti-virus a system software? **(2 marks)**
(c) Which of the following are system software? Microsoft PowerPoint, Linux, MS-DOS, C++, Compiler, or Sidonia (for transactions at the Douala sea port). **(3 marks)**

(ii) (a) Why should there be multitasking in operating systems? Give 3 reasons. **(3 marks)**
(b) Could the First-Come-First-Served scheduling strategy be used in a multitasking computer? Explain your answer. What is its major shortcoming? **(4 marks)**
(c) Give 4 major differences between the scheduling strategies: "Round Robin" and First-Come-First-Served. **(4 marks)**

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4. (i) A variable x is declared as an integer. Is the assignment x ← 2.08 possible? Why or why not? If instead of the above, the assignment x ← a is done where a is declared to be a character variable. Is this appropriate? Explain your answer. **(6 marks)**

(ii) If a variable b is declared as Boolean, how many bits are necessary to represent a value of b? Explain. **(3 marks)**

(iii) (a) How many bits make up a byte? **(1 mark)**
(b) If a character is represented by 7 bits, how many bytes can be used in representing a chain of 28 characters? **(2 marks)**

(iv) Given that an integer is represented in 16 bits and a character in 8 bits, a structure is defined to store information about each worker of a certain company as follows:
- Name (20 characters)
- Date of birth (3 integers and 2 characters) i.e. (Date – Month – Year) or D/M/Y
- Date of recruitment (same as date of birth)
- Salary (integer)

(a) How many bytes are needed to hold information of a worker in this company? **(5 marks)**
(b) If the company has 300,000 workers, how many megabytes of disc space are necessary to hold information on all the workers of the company? **(3 marks)**

(Assume 1 Megabyte = 2^{20}bytes)

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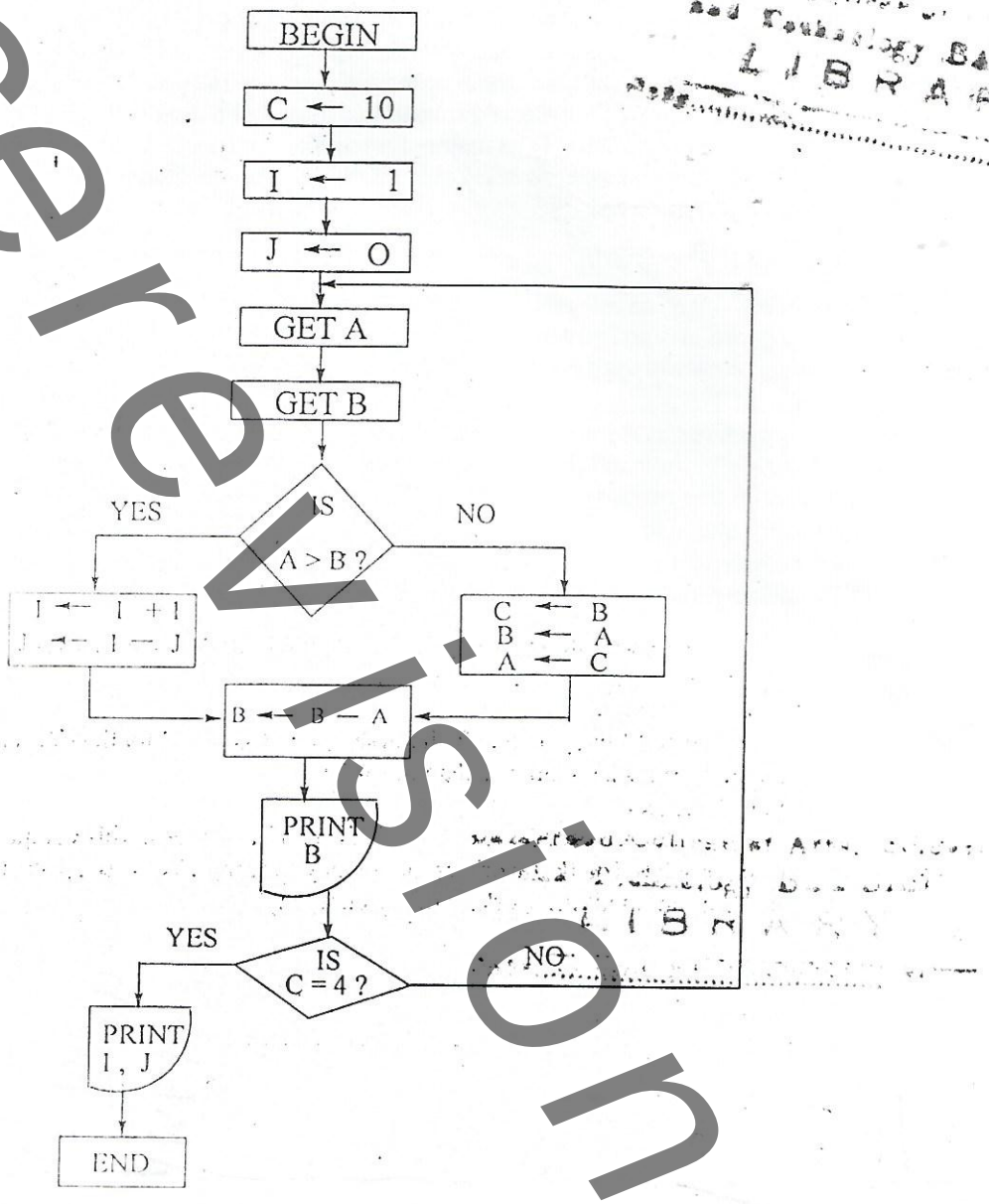
5. (i) Define the term algorithm and state THREE important qualities of a good algorithm. **(4 marks)**

(ii) Study the flow chart below and answer the questions that follow.



(a) Taking space complexity as the amount of memory space allocated to data items during the execution of a program, give the space complexity of the flowchart. **(2 marks)**

(b) Run this chart manually, writing down the values printed on the screen. Take as input the pairs: (5,16), (13,10), (4,17), (8,14), and (4,8). **(12 marks)**

(c) What are the different possible values of J in the chart? **(2 marks)**

6. (i) (a) What is a prototype in software development? **(2 marks)**

(b) State FOUR uses of a prototype. **(4 marks)**

(c) What is prototype refinement and when is it done? **(2 marks)**

(d) Can a prototype be useful during maintenance? Explain. **(3 marks)**

(ii) (a) What is software reuse? **(3 marks)**

(b) Two functions for the square root of a number are defined as *sqrt1(n)* and *sqrt2()* where $sqrt1(n) = \sqrt{n}$ for a given n, and $sqrt2() = \sqrt{x}$ for some number x given within *sqrt2()* at execution time. Which of the two functions is more appropriate for reuse? Why? **(3 marks)**

(c) The two functions in (b) both return the value of the positive square root of the number given. What check must be made in the code of each function so that they work correctly? **(2 marks)**

7. (i) What do you understand by the term divide-and-conquer in software development? **(3 marks)**

(ii) To verify that in a certain text file all the words have their correct spellings, a system called "SPELLING CHECK" is to be developed. SPELLING CHECK works as follows: A user gives the name of the file from which words are retrieved and put in a table. The table is then sorted in alphabetical order. Each word in the table is then searched for in a dictionary. (The dictionary contains a list of valid English words recognized by SPELLING CHECK). If it is found in the dictionary, SPELLING CHECK simply goes on to check the next available word. Otherwise SPELLING CHECK adds an asterisk (*) to the end of the word in the table before going on to check the next word.

(a) Identify 5 major modules (i.e., functional unit, subcomponent, subsystem, or whatever) of the system SPELLING CHECK and specify their inputs and possible outputs. Present your answer in the form of a table. **(10 marks)**

(b) Taking "Treating Unknown Word" to be the purpose of one of the modules, identify 3 of its basic operations. **(2 marks)**

(iii) (a) The number of elements in the table mentioned in (ii) above depends on the number of words in the file. Which of the following statements better describes the desired size of the table? Give reasons for your answer.

T = table of n words, n = natural number.

T = table of n words, n = 10000. **(3 marks)**

(b) If the input file does not exist, what appropriate action should SPELLING CHECK take so that the program still works correctly and users still understand what is happening? **(2 marks)**

8. (i)(a) Sketch a Von Neuman computer model, identifying its block components. **(5 marks)**

(b) Explain the Fetch–Decode–Execute cycle in computer architecture, giving at each stage the block components identified in (a) that are involved. **(6 marks)**

(c) You want a computer whose only task is to calculate averages. That is, numbers are given one after the other and then the average of the numbers is calculated. Does this computer need a central memory? Why or why not? **(4 marks)**

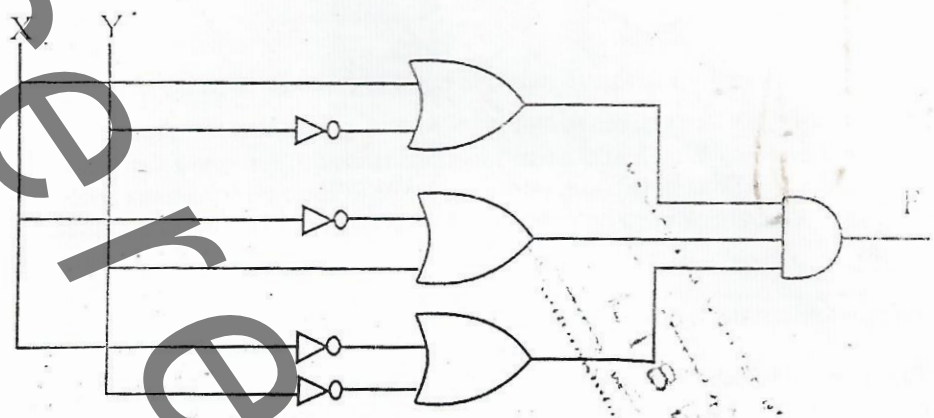
(ii) (a) What is the purpose of RAM in a computer? **(2 mark)**

(b) Why can we not use ROM instead of RAM? **(3 marks)**

9. (i) (a) State the Associative Laws of Boolean algebra for the AND and OR operations. **(2 marks)**

(b) Use a truth table to verify the laws in (a). **(6 marks)**

(ii) (a) Write in terms of X and Y the equivalent Boolean expression for F in the following logic circuit:



(4 marks)

(b) Define each of the following terms as used in computing: bit, byte and word. **(4 marks)**

(c) What is two's complement of the binary number 0011? **(2 marks)**

(d) Give TWO reasons why the computer represents information in binary. (2 marks)