Computer Science 2
0795

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD
General Certificate of Education Examination / Technical and Vocational Education Examination

JUNE 2020   **ADVANCED LEVEL**

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

GCE REVISION

Two and a half 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.

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1. (i) (a) In data transmission, what is a parity bit? How does one detect errors during data transmission? **(2 marks)**

(b) Suppose the notation #X means "take the value of X" and R1, R2, R3 are registers. Given ADD as an OPcode and (R1,R2, #R3) and (R2, #10) as operands. State for each set of operands one distinct addressing mode and how it may work with the ADD opcoode. **(4 marks)**

(ii) Computer images are described as Bitmapped or Vector graphics.
   (a) Describe how images are represented and manipulated as Bitmapped and Vector graphics images. **(3 marks)**
   (b) State one advantage and one disadvantage of using Vector graphics over a bitmapped graphics. **(2 mark)**

(iii) (a) State what you understand by the term data compression. **(1 mark)**
   (b) State two types of compression techniques. Explain how each works. **(4 marks)**
   (c) Distinguish between data compression and data encryption. **(1 mark)**

2. (i) (a) Describe the stored program concept in von Neumann Machine architecture **(2 marks)**
   (b) Illustrate with registers how an instruction is fetched and loaded for execution **(4 marks)**

(ii) Describe the role of each of the following:
   (a) The Control Unit. **(2 marks)**
   (b) The Arithmetic and Logical Unit. **(2 marks)**
   (c) The I /O controller. **(2 marks)**

(iii) (a) What is the largest number of distinct data items that can be transferred over a data bus with 16 lines? **(2 marks)**
   (b) A particular computer has 256 MB of RAM. How many bus lines are needed to address every byte of this memory? **(3 marks)**

3. (i) (a) State three main types of interrupts and their role in the operating machine. Justify the relative properties of among interrupts from these classes if any. **(5 mark)**
   (b) Briefly describe two common types of process scheduling policies used in operating systems. **(4 mark)**
   (c) Briefly explain how interrupts are used when Scheduling processes in an operating system. **(3 mark)**

(ii) (a) Distinguish between paging and segmentation with respect to memory management techniques. **(2 marks)**
   (b) Describe how virtual memory can allow a word processor and a spreadsheet applications to run simultaneously in the memory of a computer, even when both software packages are too large to fit into the computer's RAM. **(3 marks)**

4. A research department of a teaching hospital needs to share the results of it research with other interested bodies and individuals. The research is currently published and discussed via the internet.
   (i) The National Association of Teaching Hospitals (NATH) is considering the use of private intranet for such research communications. Discuss the advantages and disadvantages of using an intranet in this example. **(6 marks)**
   (ii) Pages on the intranet are produced using hypertext markup language (HTML). Describe three HTML methods that can be used to enhance free text formats in order to make the pages more user friendly. **(5 marks)**
   (iii) LANs are used in the data communication network of a company. Explain the purpose of each of the following as used in the NATH computer network:

   (a) Routers. **(2 marks)**
   (b) Bridges, **(2 marks)**
   (c) Modems. **(2 marks)**

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5. (i) (a) Explain what is meant by the following, giving an example of each terms: off-the-shelf software, custom-written software. **(4 marks)**

(b) Give three advantages and one disadvantage of using off-the-shelf software rather than custom software. **(4 marks)**

(ii) An examination centre holds data about candidates at the centre. The data stored for each candidate are:
- 4 digit candidate number.
- Candidate name (30 characters).
- Gender (1 character).
- Date of birth (8 characters).
- Number of subjects registered (2 digit).

(a) If 200 candidates are registered at the center, calculate the expected size of file to store this information. Show your working and give your answer in bytes. **(6 marks)**

(b) State a suitable medium for saving a back-up copy of the file in (a) above giving a reason for your answer. **(3 marks)**

6. An organization intent to store a significant amount of data about its information system.

(i) Describe four advantages of storing this data in a database rather than in a series of flat files. **(4 marks)**

(ii) Four entities of the organization are: Worker, Customer, Product and Department.
(a) Suggest an identifier, with justification, for any three entities. **(6 marks)**
(b) Describe three relationships that can be inferred from these entities. **(3 marks)**

(iii) Give relational database tables for any two of the entities you used to describe relationships in ii(b). For example STUDENT(StedentMaricule, name, gender, DOB) for the entity student. **(4 marks)**

7. (i) Explain the following terms as used in programming:
(a) Inheritance.
(b) Programming paradigm.
(c) Encapsulation.
(d) Dynamic data structure. **(8 marks)**

(ii) (a) Explain how the linear search algorithm works, given an array of size N. **(2 marks)**
(b) State two main properties of a first generation programming language. **(2 marks)**

(iii) Figure A below is a pseudo-code for the function factorial

```
Integer fact(int n)
Begin
        If n==1 Then
            return 1;
        Else
            return (n*fact(n-1));
End
```

Figure A.

(a) Write an iterative version of the function factorial. Label it figure B. **(3 marks)**
(b) Justify why programmers prefer the iterative function B over the recursive function A. **(2 marks)**

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8. (i) The time complexity of an algorithm gives an indication of the amount of time the algorithm will take to run completely.

    (a) Is the time complexity of an algorithm based on the best-case or the worst-case scenario of the Algorithm? **(1 mark)**

    (b) Give the tight upper bound for the algorithms with the following time functions. Use the big O notation for your answers.

        1. n^2+3n+1

        2. $2n + \log n$

        3. $n+n^3+2^n$ **(5 marks)**

    (c) Which of the algorithms in (i)(b) is most efficient? **(1 mark)**

(ii) The travelling salesman problem involves finding the shortest route between cities given that each city is visited once and only once.

    (a) The traveling salesman problem is an example of an intractable problem. What is an intractable? problem? **(2 marks)**

    (b) What strategy can be used to reduce the time needed to solve an intractable problem? **(2 marks)**

(iii) Reverse Polish Notation(RPN) is a way of representing calculations.

    (a) Give one major advantage of using RPN rather than infix in computers. **(1 mark)**

    (b) Find the result of each of the following calculations.

        a. -87*

        b. 93+21-/

        c. 87463*2/*+- **(5 marks)**

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