CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

JUNE 2017 ADVANCED LEVEL

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

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.

1. (i) (a) State one difference between SRAM and DRAM. (1 mark)
(b) Explain why both SRAM and DRAM would both lose their information when there is no electric power supply. (1 mark)

(ii) (a) There are 3 main parts of a computer system. Name them. (3 marks)
(b) Draw the components of a Von Neumann computer and label its hardware devices. (4 marks)

(iii) Given the Boolean function $F = xy'z + x'y'z + xyz$,
(a) Draw the truth table of the function. (3 marks)
(b) Draw the logic diagram using the original Boolean expression. (3 marks)
(c) Simplify the algebraic expression using identities in Boolean algebra. (2 marks)

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2. (i) (a) Briefly explain two main characteristics of a computer storage device. For each characteristic, state its unit of measurement. (4 marks)
(b) What is storage medium? (1 mark)
(c) Give two examples of storage media (2 marks)

(ii) (a) Explain briefly the following computing terms, giving an example of each.
- Interrupts
- Polling
- Bus

(6 marks)

(iii) State TWO main differences between RISC and CISC machines. (4 marks)

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3. (i) (a) What is deadlock as an operating system concept? (1 mark)
(b) Concurrent processes are executed in an operating system where they share the resources A, B, C, D, E, F, G, H . R, S, T, U, V, W and X. At one moment the resource allocation is as follows:

- Process A holds resource R and wants S.
- B holds nothing and wants S.
- C holds X and wants S.
- D holds U and wants S and T.
- E holds T and wants V.
- F holds W and wants S.
- G holds V and wants U.
- H holds nothing and wants W and X.

Representing processes in circles e.g. (A), resources in squares e.g. [R], and using the arrow notation (A) → [R] to mean A wants R, and (A) ← [R] to mean A holds R, draw a resource allocation graph following the description above . (8 marks)

(c) According to this graph, is there a possibility of deadlock? If yes, give the deadlock cycle. If no, explain your answer. (3 marks)

(ii) (a) CPU utilization is given by $(1 - P^n)$ % where n is the number of processes in the memory at the same time, and P is the fraction of time each process spent waiting for I/O to complete. How many processes must be in memory at the same time in order to guarantee that CPU time wasted is at most 5% given that each process spends 90% of time waiting for I/O. (2 marks)

(b) If the average memory allocation for each process in (ii)(a) is 256 MB and the computer has a 32 bit address system, is memory management necessary? Explain. (3 marks)

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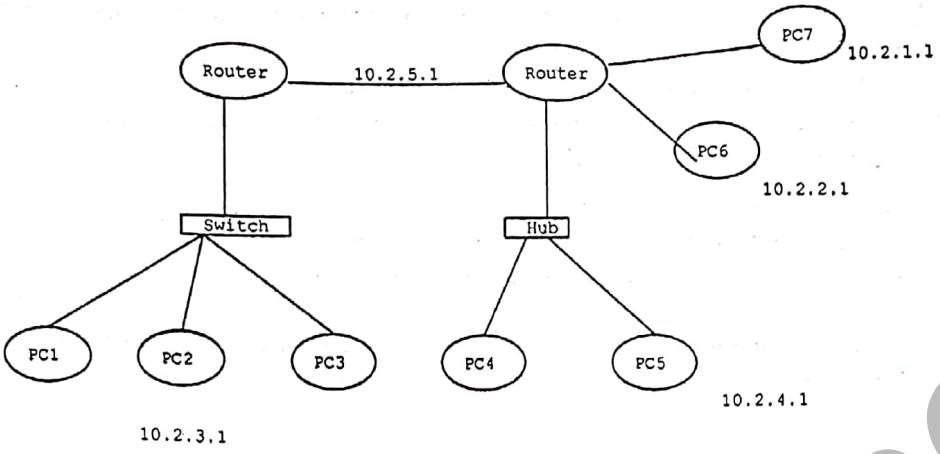
4. (i) Consider the network topology below where the network address is the first 24 bits and the host address is the last 8 bits of the complete address.



(a) How many networks are there? **(2 marks)**

(b) Give the network addresses of the various existing networks **(5 marks)**

(c) Can PC1 communicate with PC7 by simple broadcast? Explain **(3 marks)**

(ii) (a) Give the basic components of data communication **(3 marks)**

(b) What is a medium in data communication? **(1 mark)**

(c) Using an annotated diagram only, describe the principle by which an optical fibre cable functions. **(3 marks)**

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5. (i) (a) With respect to databases, explain the following, giving an example of each.
- A data model.
- Normalisation.
- SQL. **(6 marks)**

(b) Name and explain TWO of the 3 levels of data base descriptions (schemas) usually used in database design. **(2 marks)**

(ii) (a) What is meant by DBMS? Give 2 important functions performed by a DBMS. **(3 marks)**

(b) Give and explain two disadvantages of using the file processing system and two advantages of using a DBMS. **(4 marks)**

(iii) In Entity-Relationship modelling, what does the degree (or mapping cardinalities or cardinality ratio) of a relationship type specify? Give an example of a cardinality ratio. **(2 marks)**

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6. (i) (a) Write a recursive algorithm to calculate the factorial of a positive integer n (i.e. $n!$). Note that $\mathbf{1! = 1}$ **(3 marks)**

(b) Write an iterative algorithm for the same computation as in (a) above. **(3 marks)**

(c) Which of them is faster at runtime? Why? **(4 marks)**

(ii) Consider the two codes below used in the calculating area of a circle, with $\pi = 3.4$.

```
Area ( )
 Begin
   Write ("enter radius");
   Area ← r * r * 3.4
end
```

(a)

and

```
Area (r)
 Begin
   Area ← r * r *3.4
end
```

(b)

(a) Which of the codes, (a) or (b), is reusable in calculating the total surface area of a closed cylinder, where radius and height are given by user via the key board? Explain your choice. **(3 marks)**

(b) Write the algorithm for calculating the total surface area of the cylinder in (ii)(a). Use the function (b) to compute the area of circle. **(4 marks)**

7. (i) The quality of software is determined by six major attributes: functionality, reliability, usability, efficiency, maintainability and portability. Define these terms in the light of software quality assurance. **(6 marks)**

(ii) (a) What is a prototype? **(2 marks)**
(b) What is a throw away prototype? **(1 mark)**
(c) What is an incremental prototype? **(1 mark)**
(d) What quality attribute of software makes a prototype incremental? Explain. **(3 marks)**

(iii) Explain the importance of documentation:
(a) To the software user. **(2 marks)**
(b) To the software developer during maintenance. **(2 marks)**

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8. (i) (a) With reference to object-oriented programming, define the following terms: *Abstract data type*, *Encapsulation*, *Coupling* and *Cohesion*. **(4 marks)**

(b) What is the difference between an object in an object-oriented language and a variable in a structured programming language? **(4 marks)**

(ii) (a) Write a pseudo-code that will accept a value for an integer and display the message "positive" or "negative" based on the integer entered. **(3 marks)**
(b) Using the pseudo-code created, draw its flowchart. **(3 marks)**
(c) What are structure diagrams? Give two reasons why they are important in software Development. **(3 marks)**

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9. (i) (a) Distinguish between the following three types of programming errors: *Syntax*, *logic* and *run time* errors. **(3 marks)**
(b) In programming terms, what is the difference between an array and a record? **(2 marks)**
(c) Give an example EACH of:
- data that would best be handled as an array,
- data that would best be handled as a record,
- data that would best be handled as a combination of array and record. **(3 marks)**

(ii) Create a trace table to determine the output of the following algorithm:

```
Step1:          a ← 10
Step 2: set b ← 12
Step 3: set c ← 23
Step 4: set a ← a + b + c
Step 5: set b ← a-b
Step 6: set c ← b-c
Step 7: if a>b then
                    set m ← a
                    set n ← b
                    set p ← c
        else
                    set m ← c
                    set n ← a
                    set p ← b
        endif
Step 8: display m,n, and p
```

(5 marks)

(iii) Give two advantages and two disadvantages of high-level programming languages over low-level ones. **(4 marks)**
