

A ATVE

MARCH 2022

The Teachers' Resource Unit and the Regional Inspectorate of Pedagogy, in collaboration with COSTA	SUBJECT CODE NUMBER 0795	PAPER NUMBER 2
GENERAL CERTIFICATE OF EDUCATION AND INTERMEDIATE TECHNICAL AND VOCATIONAL EDUCATION REGIONAL MOCK EXAMINATION	SUBJECT TITLE COMPUTER SCIENCE	
ADVANCED LEVEL		

Time Allowed: TWO and a half hours
INSTRUCTIONS TO CANDIDATES

Mobile phones are NOT ALLOWED in the examination room.

- ❖ *Answer any SIX questions.*
- ❖ *All questions carry 17 marks each. For your guidance, the appropriate 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.*
- ❖ *Calculators are allowed.*

TURN OVER

1. (i) Define the following as used in Computer Architecture
 (a) A Buffer (2 marks)
 (b) An Interrupt (2 marks)
- (ii) State TWO activities in each case that will lead to
 (a) Creation of a Process (2 marks)
 (b) Termination of a Process (2 marks)
- (iii) You have been working on your laptop for a while and it just got frozen. Only then did you realize you were running too many programs. Your task manager statistics shows that the freeze has been caused by some four processes (P1, P2, P3, P4) allocated one resource each and requesting one resource each from four available resources (R1, R2, R3, R4).
 (a) Model the deadlock situation using a Suitable Graph (4 marks)
 (b) Which condition from your Graph confirms that Deadlock has occurred? Explain this condition. (3 marks)
- (iv) A computer is a digital Electronic device that can only understand zeros and ones (machine language). How will a Digital computer represent the denary number 75.625 as a Binary Coded Decimal (BCD) number? (2 marks)
-
2. (i) A programming Paradigm is a style of programming supported by a programming language. An example of a programming paradigm is Procedural programming supported by languages such as C and Pascal.
 Briefly describe **Imperative** and **Object Oriented** Programming paradigms giving an example of each and a language that supports it. (4 marks)
- (ii) In computer Architecture, addressing mode refers to the way in which the processor accesses operands during execution of an instruction. Low level programs are usually written in Assembly language.
 (a) Explain the difference between **Immediate**, **Direct** and **Indirect** Addressing modes. (3 marks)
- (b) Using the following Instructions
 LDA X ; Load value stored in X into the Accumulator
 ADD X ; Add number stored in X to the Accumulator
 STA X ; Store the value in the Accumulator in location X
- Write an **Assembly language program** that adds together the values stored in memory locations **num1** and **num2**, storing the resulting total in memory location **num3**. (3 marks)
- (iii) Using the **rules of Boolean algebra**, simplify the Boolean function

$$Y = (\overline{A} + A.(A + B)) + (\overline{B}.C)$$
 (4 marks)
- (iv) Briefly explain the following programming language properties; **Syntax**, **Semantics** and **Pragmatics** (3 marks)
-
3. A bakery accepts catering orders from customers. Most of them are regular customers and each one is given an ID number. A CUSTOMER is issued an invoice when he places an ORDER, which indicates each PRODUCT that the customer has ordered and the date that he can pick up his products. At the order taking counter the bakery displays a list of products that it produces.
- At least one customer **has placed** many orders,
 - At least one order **contains** many order details,
 - At least one product **appears in** many order details.
- Details of the orders are to be stored in a database using the following four relations:
- Customer (**Customer ID**, Customer Name, Gender, Telephone Number)
 - Product (**Product ID**, Product Name, Unit Price)
 - Orders (**Order ID**, Order Date, **Customer ID**)
 - Order Details(**Order ID**, **Product ID**, Quantity Ordered, Expiry Date)

- (i) These relations are in **Third Normal Form**.
 (a) Explain what it means for a relation to be in third normal form? (2 marks)
 (b) Why is it important for a relation in a database to be in Third Normal Form? (2 marks)
- (ii) Draw an Entity-Relationship diagram to show the degree of the relationships that exist between the entities. (4 marks)
- (iii) (a) Write a Data Definition Language (DDL) statement to create the Customer relation, including the key field. (4 marks)
 (b) Give an adequate table of four non repeating occurrences for the Product relation. (2 marks)
- (c) The customer named 'Cunnyman' is to be renamed 'Neumann'. Write a SQL statement to update the data in the customer table to reflect this change. (3 marks)

4. (i) (a) Convert the number -14.25 to normalized binary floating point with 6 bits mantissa and 4 bits exponent. (4 marks)

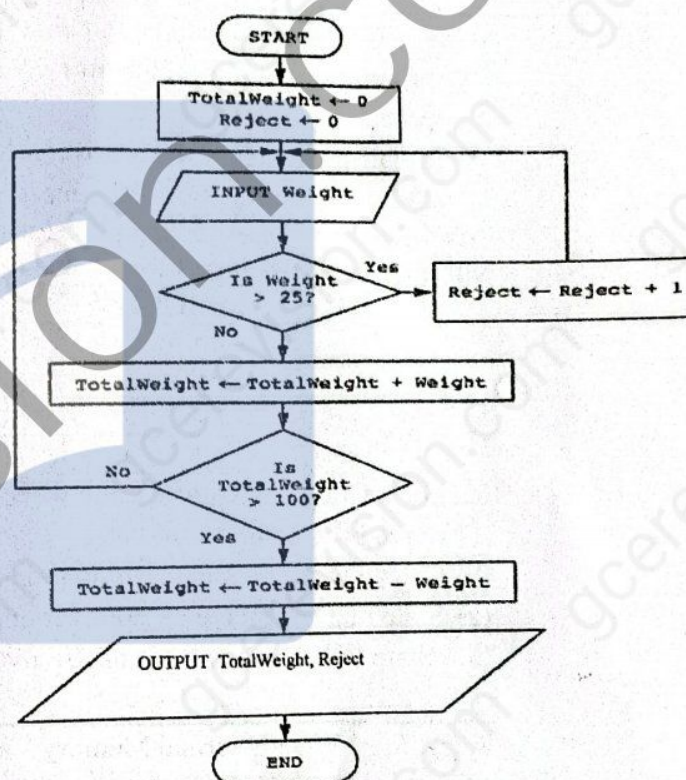
(b) With the aid of a diagram, explain the four main components that constitute the Von Neumann computer system. (5 marks)

(ii) Differentiate between the following terms as used in Data communication

(a) Parallel and Serial modes of communication. (2 marks)

(b) Simplex and Full Duplex modes of data transmission. (2 marks)

(iii) The flowchart inputs the weight of items in kilograms to be loaded on a trailer. Any item over 25 kilograms is rejected. The trailer can take up to 100 kilograms.



Record a Trace table (containing the variables weight, Reject, TotalWeight and the Output) for the Input data: 13, 17, 26, 25, 5, 10, 15

(4 marks)

5. (i) (a) Briefly explain the concept of divide and conquer algorithms to binary search (2 marks)
 (b) Apply the bubble sort to the following array. Write out a row of array the elements each time an element is moved.

15	4	5	1	10
----	---	---	---	----

(4 marks)

(2 marks)

(ii) Briefly state a difference between global and local variables.

(iii) A security light was recently installed at the Bamenda regional Hospital Entrance. The light must turn ON when it is Dark and there is movement around the gate. If it is dark and there is no movement, the light is OFF. It can also be turned ON when the security guard presses on a push button.

- A light sensor "A" is used to detect darkness

TURN OVER

- A motion sensor "B" is used to detect movement
- The push button is denoted "C"
- The Output (Light ON) is denoted Q.

- (a) Deduce the truth table for the Security light circuit (4 marks)
- (b) From the Truth table write and minimize the Boolean expression of the output Q. (3 marks)
- (c) Draw the Logic circuit for the Security light System (2 marks)

6. (i) Explain the following Modular design Concepts:

- a) Coupling (2 marks)
- b) Cohesion (2 marks)
- (c) Which concept between (a) and (b) should be Maximized when designing Modular Software? Why? (2 marks)

(ii) With the aid of a diagram. Explain the possible transitions through which a program passes during execution till it exits the CPU. (8 marks)

(iii) State and briefly explain one advantage of encryption in relation to data communication. (3 marks)

7. (i) (a) What is a Recursive function? (1 marks)

(b) Explain what **Direct Memory Access** is and give one advantage of this memory access approach (3 marks)

(c) Differentiate between **Sequential** and **Random** File Access methods (2 marks)

(d) Briefly outline two differences between an algorithm and a program. (2 marks)

(ii) Given that the following processes arrive for execution at the times indicated, each process will run for the amount of time listed (in microseconds).

PROCESS	BURST TIME
P0	5
P1	3
P2	8
P3	1

(a) Draw Gantt charts for these processes with the Shortest Job First (SJF) and First Come First Served (FCFS) scheduling. (2 marks)

(b) Calculate the average waiting time for each of the algorithms in question (ii) (a) (4 marks)

(c) State one advantage of SJF over other scheduling Algorithms. (1 mark)

(d) State two disadvantages of SJF over other scheduling Algorithms. (2 marks)

8. (i) (a) What is virtual Memory? (2 marks)

(b) What is the Difference between Physical and Logical Address? (2 marks)

(c) Evaluate the equivalent Infix expression of the Postfix expression $25 * 63 / \% 23 * +$ (2 marks)

(ii) Statistics from Network Service Providers have shown that the amount of data that is exchanged between users on a network has increased in millions of Exabyte, with the advent of digital age; and hence there is need for high bandwidths.

(a) Briefly explain the concept bandwidth and its unit of measurement in communication? (2 marks)

(b) Outline two security concerns for the Network Service Provider. (2 marks)

(c) Outline any two major considerations in setting up a network? (2 marks)

(d) State and briefly explain five components in a communication system. (5 marks)

GOOD LUCK!