

# 2023 COMPUTER SCIENCE P2 PREP

---



*For Performance Measurement*

## THE LAST SEMINAR UPDATE

---

THE CYBERWAVE

Authored by: LIONEL CHENYIKA



Section 1: Logic Gates (20 marks)

For this logic statement:

$$X = 1 \text{ if } ((A \text{ is } 1 \text{ AND } B \text{ is } 1) \text{ OR } (B \text{ is } 1 \text{ AND } C \text{ is NOT } 1))$$

(a) Draw the logic circuit.



[4]

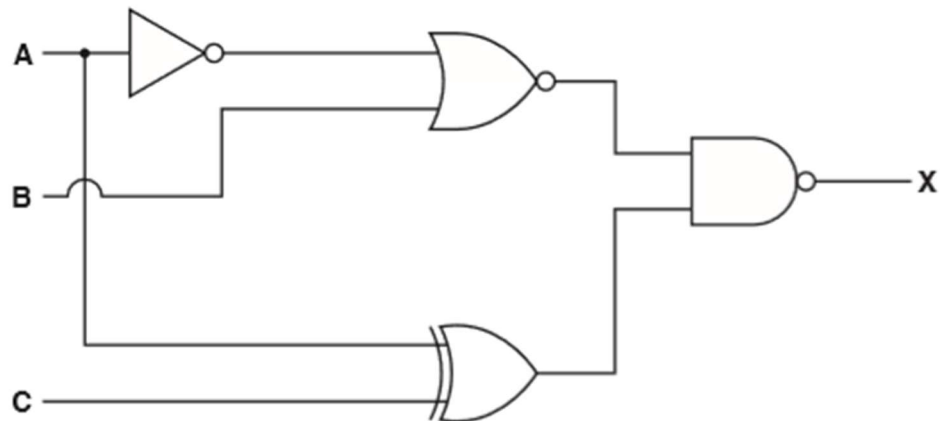
(b) Complete the truth table for the given logic statement.

| A | B | C | Working space | X |
|---|---|---|---------------|---|
| 0 | 0 | 0 |               |   |
| 0 | 0 | 1 |               |   |
| 0 | 1 | 0 |               |   |
| 0 | 1 | 1 |               |   |
| 1 | 0 | 0 |               |   |
| 1 | 0 | 1 |               |   |
| 1 | 1 | 0 |               |   |
| 1 | 1 | 1 |               |   |

[4]

## Question 2

3 A logic circuit is shown:



(a) Complete the truth table for the given logic circuit.

| A | B | C | Working space | X |
|---|---|---|---------------|---|
| 0 | 0 | 0 |               |   |
| 0 | 0 | 1 |               |   |
| 0 | 1 | 0 |               |   |
| 0 | 1 | 1 |               |   |
| 1 | 0 | 0 |               |   |
| 1 | 0 | 1 |               |   |
| 1 | 1 | 0 |               |   |
| 1 | 1 | 1 |               |   |

[4]

(b) Explain the difference between the functions of an AND gate and an OR gate.

.....

.....

.....

.....

.....

.....

[3]

- i. Design a logic gate circuit that will output a 1 if either input is a 1, but not both inputs.

.....

- ii. Implement a full adder using only basic logic gates

.....

Question 3

Draw a diagram showing the connection of the computer registers and the memory

|  |
|--|
|  |
|  |
|  |
|  |
|  |
|  |

|  |
|--|
|  |
|--|

.....

Question 4

Draw the system flowchart to illustrate stages of the FDE Cycle

.....

## Section B: VB Interface Design

## Question 5

- i. Create a VB application with a graphical user interface (GUI) that allows users to enter their name and age, and then displays a message greeting them by name and indicating whether they are an adult or a minor. [7]
- ii. Explain the principles of object-oriented programming (OOP) and how they are implemented in VB.NET. Create a sample program illustrating the 4 principles [8]

## Question 6

- i. Write a recursive VB function that calculates the factorial of a given number.[5]
- ii. Write a recursive program that calculates the fibonacci sequence of 10 numbers [5]
- iii. Create a custom function to generate a random password with a specified length and character requirements. [10]

## Question 6

- i. The computer science Class of 2023 is writing their final year board exams. Their marks for paper 1 and 2 will be stored in one array for each student i.e student1(),..... Using the concept of 2D arrays, write a vb program to store the exam marks of 5 students. The exam grade is generated from averaging the 2 exam marks for paper 1 and 2[10]

Hint outer loop 5 students, inner loop 2 exams

- ii. Table for Randomdata(min,max)

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| 1   | 17  | 34  | 56  | 29  | 32  |
| [0] | [1] | [2] | [3] | [4] | [5] |

Create a program to perform bubble sort using the specimen data above[10]

**Question7**

A driving club has both junior and senior members. Each member has a unique membership number, name and address recorded. Three classes have been identified, namely: Member, Junior Member, Senior Member

The classes Junior Member and Senior Member are related by single inheritance to the class member.

i) Draw an inheritance diagram for the classes. [3]

Programs that use objects of the class member need to add a new member's details and show member's details and also amend a member's details. No other form of access is to be allowed. Write a class definition for this class. member = class [8]

**Question 8**

Study the code carefully and draw the relevant Structure Diagram [10]

```
Class reservation
    Public reservationID
    Public Seatnum
    Public Sub book_a_seat()

    End Sub
    Public Sub get_seat_num()

    End Sub
End Class
Class VIP
    Inherits reservation
    Public ID_num
    Public Sub set_Vip()

    End Sub
    Public Sub get_reservation_type()

    End Sub
Class Standard
    Inherits reservation
    Public Sub set_Standard()

    End Sub
End Class
End Class
```



Question 9

SQL (25 marks)

- i. Write an SQL query to retrieve the name, email, and city for all customers who have placed an order in the past month.
- ii. Normalize the following database schema to eliminate data redundancy:

Customers (customer\_id, name, email, city)

Orders (order\_id, customer\_id, product\_id, quantity)

Products (product\_id, name, price)

- iii. Discuss the importance of data integrity and the different techniques used to ensure data integrity in SQL databases.

Question 10

5. (a) In a library database, authors have written books about various subjects. Different libraries in the system may carry those books. Authors have ID number, name, and telephone number. Books have an ISDN and title. Subjects have a subject name. Libraries have a library name.

Produce a normalised ER diagram to depict the scenario above. [14]

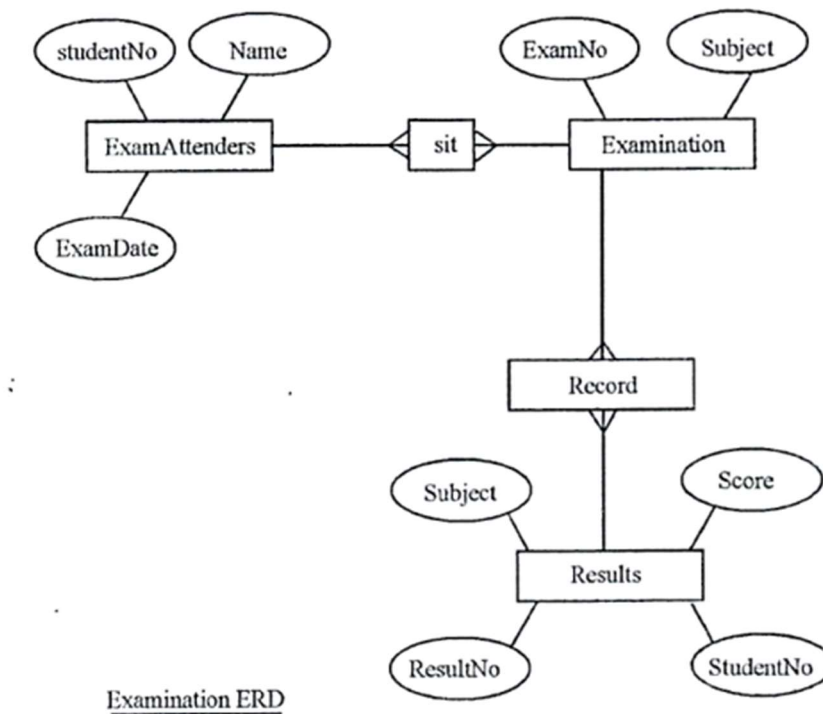
(b) A supermarket sells groceries to customers on account. The shopkeeper then produces an invoice as shown below produces an invoice as shown below.

| Customer A/C: 6065913 |        | Date: 21/01/17       |      |           |
|-----------------------|--------|----------------------|------|-----------|
| Ruth Chakanyuka       |        | Time: 10:42 am       |      |           |
| Ngozil Mine           |        | INV: D10059012       |      |           |
| Bulawayo              |        |                      |      |           |
| Cell: 0772 023 011    |        |                      |      |           |
| Code                  | Qty    | Description          | Unit | Sub Total |
| 60092317651           | 10     | Chimombe milk 500 ml | 0.65 | 6.50      |
| 60051621153           | 1      | Mazoe Raspberry 2L   | 2.39 | 2.39      |
| 60031005913           | 4      | Bakers Inn Superior  | 0.90 | 3.60      |
|                       |        |                      |      |           |
| Sub Total             |        |                      |      | 10.62     |
| VA Tax                | @15.06 |                      |      | 1.87      |
| Total                 |        |                      |      | 12.49     |

- (i) Present all the information in the above invoice as a database in First Normal Form. [4]
- (ii) Normalise your answer in (i) into Second Normal Form showing all relationships amongst the resulting tables. [12]

## Question 11

The diagram below is an entity-relationship diagram for an Examinations Database.



(b) (i) Write SQL statements to display all fields in the examAttendees table for a student identified by StudentNo = R0013. [3]

(iii) Write SQL statement(s) to delete Computer Science Paper 4 from the examination table. [3]

(iv) Write SQL statements to add a duration field in the examination Entity. [3]

(v) Write SQL statement(s) to change score for ResultNo 138 from 70 to 95. [3]

(c) Suggest a key that could be used to establish the link between Examinations and Results tables. [1]

[THE END OF COMPUTER SCIENCE 2023]

Hope you Enjoyed Physically -----

Philippians 4:6-7 "Do not be anxious about anything, but in every situation, by prayer and petition, with thanksgiving, present your requests to God. And the peace of God, which transcends all understanding, will guard your hearts and your minds in Christ Jesus. -----0716057680 LIONEL CYBERWAVE

-----BEST WISHES ENGINEER, FROM ANOTHER CERTIFIED CYBER-ENGINEER-----