DATABASE DEVELOPMENT EXAM

Trainees Names …………………………

Class: L4 SOFTWARE DEVELOPMENT   Date: 19/03/2024

Trade: Software Development

Sector: ICT

Instructions to the candidate:

    a. Answer all the questions for section A

    b. Choose and answer three questions from section B

    c. Choose and answer only one question from section C

    d. Follow the order of the questions and use a straight line to separate your answers

SECTION A ANSWER ALL THE QUESTIONS

1. Choose and circle the correct answer/5Marks

I. What is the full form of DBMS?

    A. Data of Binary Management System
    B. Database Management System
    C. Database Management Service
    D. Data Backup Management System

II. Which type of data can be stored in the database?

    A. Image oriented data
    B. Text, files containing data
    C. Data in the form of audio or video
    D. All of the above

III. What does an RDBMS consist of?

    A. Collection of Records
    B. Collection of Keys
    C. Collection of Tables
    D. Collection of Fields

IV. **The values appearing in given attributes of any tuple in the referencing relation must likewise occur in specified attributes of at least one tuple in the referenced relation, according to _____ integrity constraint.**

        A. Referential

        B. Primary

        C. Referencing

        D. Specific

V. **_____ is a set of one or more attributes taken collectively to uniquely identify a record.**

        A. Primary Key

        B. Foreign key

        C. Super key

        D. Candidate key

2. **Respond by TRUE or FALSE the following expression/5Marks**

    a. In data abstraction physical level is the highest level of data abstraction. It describes how data is actually stored in database. **TRUE/FALSE**

    b. Logical level is the middle level of 3-level data abstraction architecture. It describes what data is stored in database. **TRUE/FALSE**

    c. View level Highest level of data abstraction. This level describes how data is arranged in database. **TRUE/FALSE**

    d. Functional requirements Describe functionality or system services. They depend on the type of software, expected users and the type of system where the software is used. **TRUE/FALSE**

    e. Non-functional requirements define what the system is supposed to do. e.g. reliability, response time and storage requirements. **TRUE/FALSE**

3. Mach the context in column I with the corresponding key in column II as shown on the last row of the following table. **/5Marks**
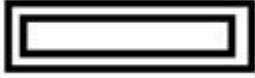
Column I	Answers	Column II
1. All the single items that are stored in a database, either individually or as a set.	1...	**A.** Questionnaire
2. A process where the designer doesn't have to meet employees. He prepares his papers before and submits it to the employees who fill it.	2...	**B.** Identifier
3. Object that exists. It doesn't have to do anything; it just has to exist. In database administration, it can be a single thing, person, place, or object	3...	**C.** Entity
4. The information about the entity that needs to be stored.	4...	**D.** Attribute
5. Specific field which enables to establish an object's occurrence individually	5...	**E.** Data
6. Fields and contains all the data about one particular person, company, or item in a database	6...**F**	**F.** Record

4. A data type is an attribute that specifies the type of data a specific column in a table can store. List and Explain at least four data types used in DBMS **/4Marks?**
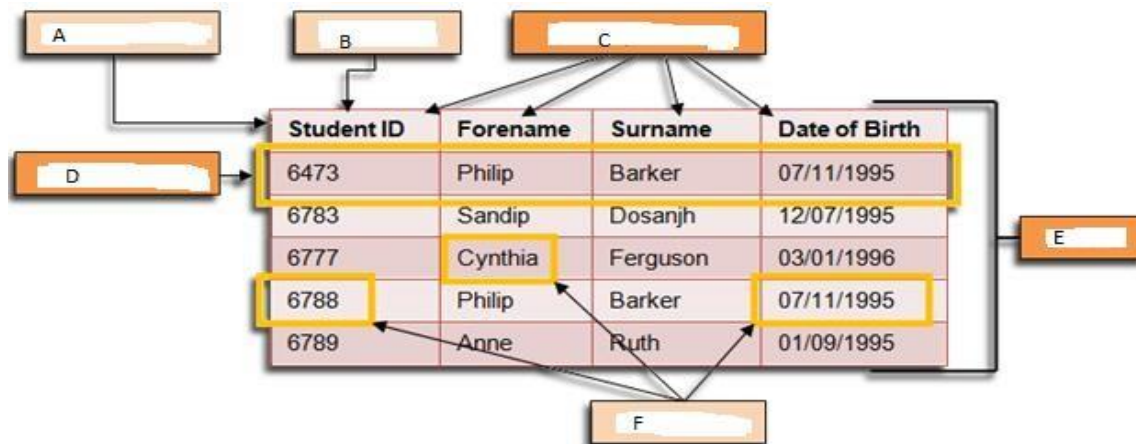
5. A relationship can be one to one, many to one, one to many or many to many. Fill in the blank (........) with the types of relationship between the two entities defined bellow. **/3Marks**

Husband	....	Wife

Football team	....	Footballer

Student	....	Subject
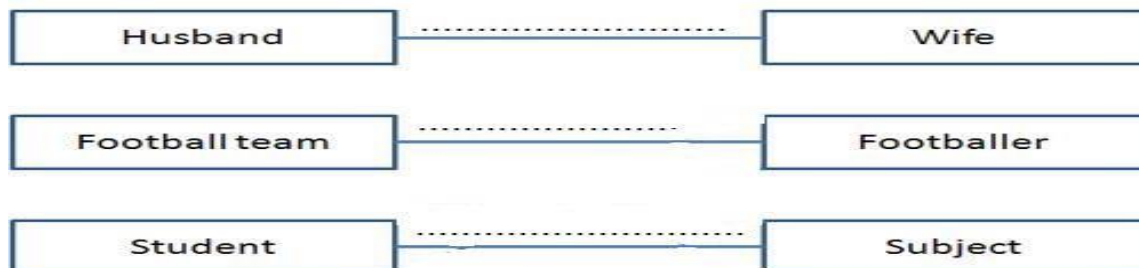
6. An Entity-Relationship Diagram (ERD) is a visual representation of **entities**, **relationships**, and **attributes** within a database. It acts like a blueprint, illustrating how data elements are interconnected and organized. The table below contains symbols and names defined in ERD, as database designer complete all empty field with symbol or name accordingly. **/6Marks**

▭ (double rectangle)	……………………………………………
……………………………………………	◇ (diamond)
Derived attribute	…………………………………………… …………………………………………… ……………………………………………
……………………………………………	(three connected ellipses)
——————————— (line)	……………………………………………
…………………………………………… …………………………………………… ……………………………………………	Entity

Q7. Name the parts A, B,C,D,E and F of the following figure (table captured from school database) **/3Marks**

A	B	C	
Student ID	**Forename**	**Surname**	**Date of Birth**
D 6473	Philip	Barker	07/11/1995
6783	Sandip	Dosanjh	12/07/1995
6777	Cynthia	Ferguson	03/01/1996
6788	Philip	Barker	07/11/1995
6789	Anne	Ruth	01/09/1995

E

F

8. Choose and cycle the correct characteristics of conceptual model of data that used in database design from the following list **/3Marks**

A. Data	E. Identifier	I. Field
B. Cardinality	F. Table	J. Occurrence
C. Computer	G. Google	K. Relationship
D. Object	H. Tuple	

9. List and explain correctly database requirements. **/5Marks**

10. Differentiate effectively database normalization from indexing. **/5Marks**

11. List at least five database table constraints separated as table levels and column levels constraints **/5Marks**

12. After defining database abstraction explain three level of data abstraction in relational database. **/5Marks**

SECTION B CHOOSE AND ANSWER ONLY THREE QUESTIONS /30Marks

13. A manufacturing company produces products. The following product information is stored: product name, product ID and quantity on hand. These products are made up of many components. Each component can be supplied by one or more suppliers. The following component information is kept: component ID, name, description, suppliers who supply them, and products in which they are used.

   A. Create an ERD to show how you would track this information. **/4Marks**

   B. Make CMD of the above scenario. **/ 3Marks**

   C. Make LMD of the above scenario. **/3Marks**

Assumptions

- A supplier can exist without providing components.

- A component does not have to be associated with a supplier.

- A component does not have to be associated with a product. Not all components are used in products.
- A product cannot exist without components.

14. Imagine you're running a library and want to create a database to manage books, authors, and borrowings. Here's a scenario with a poorly designed table that needs normalization:

boo k_id	tit le	author_ name	author_bir thplace	author_bir thyear	borrower _name	borrow _date	return _date

   a. What normalization issues are present in this table? Explain each issue briefly. **/2Marks**

   b. Design normalized tables to represent the data efficiently. Include primary and foreign keys for each table. **/6Marks**

   c. Explain how your normalized design improves data integrity and reduces redundancy. **/2Marks**

15. Match the operators in Column A with their corresponding descriptions in Column B. Write the letter of the correct description in the space provided next to each operator**. /10Marks**

1. +	a. Combine results with duplicates removed.
2. -	b. Check if a value is not equal to something.
3. *	c. Perform string concatenation.
4. /	d. Evaluate multiple conditions and return true if all are true.
5. <>	f. Perform basic mathematical calculations.
6. =	e. Check if a value is empty (null).
7. AND	g. Compare values and return true if at least one is true.
8. CONCAT	j. Combine results from multiple queries.
9. IS NULL	i. Compare values and return true if they are equal.
10. NOT	m. Multiply two values.
11. OR	h. Combine results including duplicates.
12. UNION	k. Subtract one value from another.
13. UNION ALL	l. Divide one value by another.

16. Database Language is a special type of programming language used to define and manipulate a database. They are 5 sub-languages of SQL

DDL (Data Definition Language), DML (Data Manipulation Language), DQL/DRL (Data Query Language), DCL (Data Control Language), and TCL (Transaction Control Language).

Complete the table with the following commands performed for each SQL sub language.

ALTER, COMMIT, DROP, GRANT, REVOKE, RENAME, ROLLBACK, SAVEPOINT, CREATE, SELECT, INSERT, UPDATE, DELETE, TRUNCATE

DDL	DML	DQL	DCL	TCL

17. Given the following model in school database

Student(stdid, stdusername, stdage, regdate, address)

Subject(subid, subname, #stdid)

Make queries to create the above tables assuming that student age must not be a negative number and stdusernames are distinct while address is KIGALI by default. Follow all constraints rules and data types, remember to set all primary key as not null values.

CHOOSE AND ANSWER ONLY ONE QUESTION /15 MARKS

18. You manage an online bookstore and need to maintain a database of books, authors, and customer orders. The database has three tables:

Authors: (author_id, name, birth_year)

Books: (book_id, title, author_id, price, stock)

Orders: (order_id, customer_id, book_id, quantity, order_date)

a. Answer the following questions
    i.   Make sql query that can be used to create the above tables. **/3Marks**
    ii.   A new book titled "The Hitchhiker's Guide to the Galaxy" by Douglas Adams (author_id 1) arrives with a price of $10.99 and 20 in stock. Write an SQL statement to insert this information into the "Books" table. **/3Marks**
    iii.   A customer accidentally entered the wrong quantity for their order (order_id 123) for "The Lord of the Rings" (book_id 2). They originally ordered 3 books, but they only wanted 1. Update the "Orders" table to reflect the correct quantity. **/3Marks**
    iv.   A book titled "The Da Vinci Code" (book_id 5) is no longer in print and needs to be removed from the "Books" table. However, you want to keep the order history for this book in the "Orders" table. Write an SQL statement to achieve this. **/3Marks**

  b. Create a data dictionary using the above database information. **/3Marks**

20. Imagine you're creating a database to manage information about movies, actors, and directors. Here are some practical questions using DDL commands in this scenario:

A. Write the SQL statements to create the following tables: **/6Marks**

Movies: (movie_id, title, release_year, director_id, genre)

Actors: (actor_id, name, birth_year)

Directors: (director_id, name, birth_year)

Add a **primary key constraint** to the "movie_id" column in the "Movies" table.

Add a **foreign key constraint** to the "director_id" column in the "Movies" table referencing the "director_id" column in the "Directors" table.

b. You realize the "genre" column in the "Movies" table should allow for multiple genres. How would you alter this table to accommodate this change using appropriate DDL commands? **/3Marks**

c. You decide to remove the "Actors" table from the database entirely. What command would you use, and what's the difference between using DROP and TRUNCATE in this scenario? **/3Marks**

d. The "birth_year" information in the "Actors" and "Directors" tables needs to be changed from a simple integer to a "DATE" data type. Write the SQL statement to modify these columns. **/3Marks**