**EXAMINATION OF Develop Database**

### ****Database Development Exam****

**Learning Outcome 1: Analyse Database**  
**Total Marks: [Adjust as Needed]**  
**Time: [Adjust as Needed]**

### ****Section A: Multiple Choice Questions (MCQs)****

(Each question carries 2 marks)

Which of the following best defines a **Database**?  
a) A collection of interrelated data organized to serve applications  
b) A programming language used to design systems  
c) A spreadsheet for storing information  
d) A single table used to store all information

**Answer:** a) A collection of interrelated data organized to serve applications

What is an **Entity** in a database?  
a) A specific row in a table  
b) A single field in a table  
c) A real-world object that can be identified and stored in a database  
d) A type of SQL command

**Answer:** c) A real-world object that can be identified and stored in a database

**Which of the following is NOT an advantage of a database?**  
a) Data consistency  
b) Data redundancy  
c) Data integrity  
d) Data security

**Answer:** b) Data redundancy

**Which database model organizes data in a tree-like structure?**  
a) Relational database  
b) Network database  
c) Hierarchical database  
d) Object-oriented database

**Answer:** c) Hierarchical database

**Which of the following is NOT a database relationship type?**  
a) One-to-one  
b) One-to-many  
c) Many-to-many  
d) One-to-infinity

**Answer:** d) One-to-infinity

### ****Section B: Short Answer Questions****

(Each question carries 5 marks)

**Define the following database terms:**

* 1. a) Table
  2. b) Database Schema
  3. c) DBMS
  4. d) SQL
  5. e) Attribute

**Answers:**

* 1. **Table:** A structured collection of related data arranged in rows and columns.
  2. **Database Schema:** The logical structure of a database, defining tables, relationships, and constraints.
  3. **DBMS (Database Management System):** A software system that allows users to create, manage, and manipulate databases.
  4. **SQL (Structured Query Language):** A programming language used for managing and querying relational databases.
  5. **Attribute:** A property or characteristic of an entity, represented as a column in a database table.

**List and briefly explain three applications of databases.**

**Answer:**

* 1. **Banking:** Databases store customer details, transactions, and account records.
  2. **E-commerce:** Databases manage customer orders, inventory, and payments.
  3. **Healthcare:** Databases maintain patient records, appointments, and medical history.

**Differentiate between functional and non-functional database requirements.**

**Answer:**

* 1. **Functional Requirements:** Define what the database must do, such as storing and retrieving customer data.
  2. **Non-Functional Requirements:** Define how the system performs, such as security, scalability, and response time.

**Explain the importance of a Data Dictionary in database management.**

**Answer:** A data dictionary provides detailed metadata about the database, including table definitions, field types, relationships, and constraints. It ensures consistency, helps developers understand database structure, and facilitates database maintenance.

**What are the four types of database models? Provide one key characteristic of each.**

**Answer:**

* **Relational Database:** Data is stored in tables with relationships.
* **Hierarchical Database:** Data is organized in a parent-child tree structure.
* **Network Database:** Data has multiple parent-child relationships (graph-like).
* **Object-Oriented Model:** Data is stored as objects similar to object-oriented programming.

### ****Section C: Essay Questions****

(Each question carries 10 marks)

1. **Describe different methods used to collect database requirements and discuss their advantages and disadvantages.**

**Answer:**

* **Interviews:** Direct discussion with stakeholders. (Advantage: Detailed insights; Disadvantage: Time-consuming)
* **Documentation:** Reviewing existing records. (Advantage: Reliable data; Disadvantage: May be outdated)
* **Questionnaires:** Distributing surveys. (Advantage: Can reach many users; Disadvantage: May lack depth)
* **Observation:** Watching how users interact with systems. (Advantage: Real behavior insights; Disadvantage: Can be intrusive)

1. **Explain the various types of database relationships with examples.**

**Answer:**

* **One-to-One (1:1):** Each entity in Table A is related to only one entity in Table B. (Example: A person and their passport number)
* **One-to-Many (1:M):** One entity in Table A can be related to multiple entities in Table B. (Example: A customer can place multiple orders)
* **Many-to-One (M:1):** Multiple entities in Table A are linked to a single entity in Table B. (Example: Many students belong to one school)
* **Many-to-Many (M:M):** Many entities in Table A relate to many in Table B. (Example: Students enroll in multiple courses, and courses have multiple students)

This exam covers all key topics outlined in your syllabus. Let me know if you want to modify it or add more questions! 😊

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##### You said:

please make exam that has section( A,B,C,D,E )

###### ChatGPT said:

Here is a structured **Database Development Exam** with sections **A, B, C, D, and E**, based on your provided syllabus.

# ****Database Development Examination****

**Course Title:** Develop Database  
**Learning Outcome:** Analyse Database  
**Total Marks:** 100  
**Time:** [Adjust as Needed]

## ****Section A: Multiple Choice Questions (20 Marks)****

(Each question carries 2 marks. Choose the correct answer.)

What is the primary purpose of a **Database Management System (DBMS)?**  
a) To manage files on a computer  
b) To store and retrieve structured data efficiently  
c) To create programming code  
d) To design user interfaces

**Answer:** b) To store and retrieve structured data efficiently

Which of the following best describes an **Attribute** in a database?  
a) A collection of related tables  
b) A column in a table that represents a characteristic of an entity  
c) A row in a table  
d) A unique identifier of a record

**Answer:** b) A column in a table that represents a characteristic of an entity

Which **database model** represents data as tables with relationships?  
a) Hierarchical Model  
b) Network Model  
c) Relational Model  
d) Object-Oriented Model

**Answer:** c) Relational Model

Which relationship exists when **one entity in Table A corresponds to multiple entities in Table B**?  
a) One-to-One  
b) One-to-Many  
c) Many-to-One  
d) Many-to-Many

**Answer:** b) One-to-Many

Which **data type** is best suited for storing a **date of birth**?  
a) Character  
b) Number  
c) Date  
d) Boolean

**Answer:** c) Date

## ****Section B: Short Answer Questions (20 Marks)****

(Each question carries 5 marks.)

**Define the following database terms:**  
a) Database  
b) Table  
c) Database Schema  
d) SQL  
e) DBMS

**Answer:**

* + **Database:** A structured collection of data stored for easy access and management.
  + **Table:** A structured format that stores records in rows and columns.
  + **Database Schema:** A logical blueprint defining the structure of a database.
  + **SQL:** A language used for managing relational databases.
  + **DBMS:** Software that manages and controls database interactions.

**List three advantages and two disadvantages of using a database.**

**Answer:**

* + **Advantages:**
    1. Data consistency
    2. Improved security
    3. Efficient data retrieval
  + **Disadvantages:**
    1. High initial cost
    2. Complexity in management

**What are the four types of database relationships? Provide an example for each.**

**Answer:**

* + **One-to-One:** Each employee has one ID card.
  + **One-to-Many:** One teacher teaches multiple students.
  + **Many-to-One:** Many employees work for one department.
  + **Many-to-Many:** Students enroll in multiple courses, and each course has multiple students.

**What is a data dictionary? List its key elements.**

**Answer:** A data dictionary is a collection of metadata that defines database structure.  
**Key elements include:**

* + Table names
  + Column names
  + Data types
  + Constraints (Primary Key, Foreign Key)

**Explain two methods of collecting database requirements and their importance.**

**Answer:**

* **Interview:** Direct interaction with stakeholders to gather needs. (Ensures personalized responses but is time-consuming.)
* **Questionnaire:** Structured set of questions distributed to users. (Efficient for large audiences but may lack depth.)

## ****Section C: Case Study (20 Marks)****

(Each question carries 10 marks.)

### ****Case Study:****

A **hospital database** needs to store **patient records**, **doctor details**, and **appointments**. Each **patient** has an **ID, name, age, and medical history**. Each **doctor** has an **ID, name, specialization, and assigned patients**. Patients book **appointments** with doctors on specific dates.

1. **Identify three database tables required for this hospital system and their attributes.**

**Answer:**

* **Patients Table:** PatientID, Name, Age, MedicalHistory
* **Doctors Table:** DoctorID, Name, Specialization
* **Appointments Table:** AppointmentID, PatientID, DoctorID, Date

1. **Explain the relationships between these tables and classify them.**

**Answer:**

* **One-to-Many:** A doctor can have multiple patients (Doctors → Patients).
* **Many-to-One:** Multiple appointments can be assigned to one doctor (Appointments → Doctors).
* **Many-to-Many:** Patients can have multiple appointments with multiple doctors (Appointments Table as a bridge).

## ****Section D: SQL Queries (20 Marks)****

(Each question carries 5 marks.)

1. **Write an SQL query to create a “Patients” table with the fields: PatientID (Primary Key), Name, Age, and MedicalHistory.**

sql

CopyEdit

CREATE TABLE Patients (

PatientID INT PRIMARY KEY,

Name VARCHAR(50),

Age INT,

MedicalHistory TEXT

);

1. **Write an SQL query to insert a new patient record (ID: 101, Name: "John Doe", Age: 30, MedicalHistory: "Diabetes").**

sql

CopyEdit

INSERT INTO Patients (PatientID, Name, Age, MedicalHistory)VALUES (101, 'John Doe', 30, 'Diabetes');

1. **Write an SQL query to retrieve all patients who are older than 40 years.**

sql

CopyEdit

SELECT \* FROM Patients WHERE Age > 40;

1. **Write an SQL query to display all appointments along with patient and doctor names using JOINs.**

sql

CopyEdit

SELECT Appointments.AppointmentID, Patients.Name AS PatientName,

Doctors.Name AS DoctorName, Appointments.DateFROM AppointmentsJOIN Patients ON Appointments.PatientID = Patients.PatientIDJOIN Doctors ON Appointments.DoctorID = Doctors.DoctorID;

## ****Section E: Essay Questions (20 Marks)****

(Each question carries 10 marks.)

1. **Discuss the importance of normalization in database design.**

**Answer:**  
Normalization is the process of organizing database tables to reduce redundancy and improve efficiency. It enhances data consistency, improves query performance, and minimizes storage space. The normal forms include:

* **1NF (First Normal Form):** Removes duplicate columns.
* **2NF (Second Normal Form):** Ensures every column is dependent on the primary key.
* **3NF (Third Normal Form):** Eliminates transitive dependencies.

1. **Explain database security measures and why they are important.**

**Answer:**  
Database security ensures data protection from unauthorized access, corruption, and breaches.  
**Measures include:**

* **User authentication:** Using login credentials.
* **Access control:** Restricting permissions.
* **Data encryption:** Securing sensitive information.
* **Backup and recovery:** Preventing data loss.

## ****Final Notes****

This exam comprehensively assesses knowledge of **database fundamentals, SQL, data modeling, relationships, and security**. Let me know if you need adjustments! 😊

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##### You said:

make bolded answer

###### ChatGPT said:

Here’s your formatted **Database Development Exam** with bolded answers.

# ****Database Development Examination****

**Course Title:** Develop Database  
**Learning Outcome:** Analyse Database  
**Total Marks:** 100  
**Time:** [Adjust as Needed]

## ****Section A: Multiple Choice Questions (20 Marks)****

(Each question carries 2 marks. Choose the correct answer.)

What is the primary purpose of a **Database Management System (DBMS)?**  
a) To manage files on a computer  
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Which of the following best describes an **Attribute** in a database?  
a) A collection of related tables  
b) **A column in a table that represents a characteristic of an entity**  
c) A row in a table  
d) A unique identifier of a record

Which **database model** represents data as tables with relationships?  
a) Hierarchical Model  
b) Network Model  
c) **Relational Model**  
d) Object-Oriented Model

Which relationship exists when **one entity in Table A corresponds to multiple entities in Table B**?  
a) One-to-One  
b) **One-to-Many**  
c) Many-to-One  
d) Many-to-Many

Which **data type** is best suited for storing a **date of birth**?  
a) Character  
b) Number  
c) **Date**  
d) Boolean

## ****Section B: Short Answer Questions (20 Marks)****

(Each question carries 5 marks.)

**Define the following database terms:**

* + **Database:** **A structured collection of data stored for easy access and management.**
  + **Table:** **A structured format that stores records in rows and columns.**
  + **Database Schema:** **A logical blueprint defining the structure of a database.**
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  + **DBMS:** **Software that manages and controls database interactions.**

**List three advantages and two disadvantages of using a database.**

**Advantages:**

* + **Data consistency**
  + **Improved security**
  + **Efficient data retrieval**

**Disadvantages:**

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  + **Complexity in management**

**What are the four types of database relationships? Provide an example for each.**

* + **One-to-One:** **Each employee has one ID card.**
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**What is a data dictionary? List its key elements.**

**Answer:** **A data dictionary is a collection of metadata that defines database structure.**  
**Key elements include:**

* + **Table names**
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  + **Constraints (Primary Key, Foreign Key)**

**Explain two methods of collecting database requirements and their importance.**

* **Interview:** **Direct interaction with stakeholders to gather needs.** (Ensures personalized responses but is time-consuming.)
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## ****Section C: Case Study (20 Marks)****

(Each question carries 10 marks.)

### ****Case Study:****

A **hospital database** needs to store **patient records**, **doctor details**, and **appointments**. Each **patient** has an **ID, name, age, and medical history**. Each **doctor** has an **ID, name, specialization, and assigned patients**. Patients book **appointments** with doctors on specific dates.

1. **Identify three database tables required for this hospital system and their attributes.**

* **Patients Table:** **PatientID, Name, Age, MedicalHistory**
* **Doctors Table:** **DoctorID, Name, Specialization**
* **Appointments Table:** **AppointmentID, PatientID, DoctorID, Date**

1. **Explain the relationships between these tables and classify them.**

* **One-to-Many:** **A doctor can have multiple patients (Doctors → Patients).**
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## ****Section D: SQL Queries (20 Marks)****

(Each question carries 5 marks.)

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CopyEdit

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## ****Section E: Essay Questions (20 Marks)****

(Each question carries 10 marks.)

1. **Discuss the importance of normalization in database design.**

**Answer:** **Normalization is the process of organizing database tables to reduce redundancy and improve efficiency. It enhances data consistency, improves query performance, and minimizes storage space. The normal forms include:**

* **1NF (First Normal Form):** **Removes duplicate columns.**
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1. **Explain database security measures and why they are important.**

**Answer:** **Database security ensures data protection from unauthorized access, corruption, and breaches.**  
**Measures include:**

* **User authentication:** **Using login credentials.**
* **Access control:** **Restricting permissions.**
* **Data encryption:** **Securing sensitive information.**
* **Backup and recovery:** **Preventing data loss.**

## ****Final Notes****

This exam comprehensively assesses **database fundamentals, SQL, data modeling, relationships, and security**. Let me know if you need any changes! 😊

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##### You said:

Learning outcome 2: Design Database Learning hours: 25 Indicative content • Description of database schema ✓ Introduction of database schema ✓ Types of database schema ✓ Data abstraction levels ✓ Types of data independence • Design of conceptual database schema ✓ Description of conceptual database schema ✓ Entity relationship diagram (ERD) Description of ERD Components of ERD Define relationships Create an ERD Draw an ERD (MS-Visio, Draw-Max) • Design of logical database schema ✓ Description of logical database schema ✓ Table constraints NOT NULL Constraint. UNIQUE Constraint. 8 | P a g e DEFAULT Constraint. CHECK Constraint. PRIMARY KEY Constraint. FOREIGN KEY Constraint. ✓ Convert conceptual database schema to logical database schema • Optimization of database ✓ Data normalization First normal form (1NF) Second normal form (2NF) Third normal form (3NF) ✓ Indexing • Design of Physical database schema ✓ Description of DBMS ✓ Preparation of DBMS Environment (MySQL) ✓ Convert logic database schema to physical database schema

###### ChatGPT said:

Here’s an **exam for Learning Outcome 2: Design Database**, following the structure of **Sections A, B, C, D, and E** with bolded answers.

# ****Database Development Examination****

**Course Title:** Develop Database  
**Learning Outcome 2:** Design Database  
**Total Marks:** 100  
**Time:** [Adjust as Needed]

## ****Section A: Multiple Choice Questions (20 Marks)****

(Each question carries 2 marks. Choose the correct answer.)

What is a **Database Schema**?  
a) A collection of programming scripts  
b) **A logical structure that defines the organization of data in a database**  
c) A backup file of the database  
d) A tool for visualizing data

How many levels of **data abstraction** exist in database systems?  
a) 1  
b) 2  
c) **3**  
d) 4

Which **data independence type** allows changing the **physical storage** without affecting the logical structure?  
a) Logical Independence  
b) **Physical Independence**  
c) Conceptual Independence  
d) Data Normalization

What is an **Entity Relationship Diagram (ERD)?**  
a) A database implementation technique  
b) A SQL-based data model  
c) **A graphical representation of entities and relationships**  
d) A process for database normalization

Which **normal form** removes **partial dependency**?  
a) **Second Normal Form (2NF)**  
b) First Normal Form (1NF)  
c) Third Normal Form (3NF)  
d) Boyce-Codd Normal Form (BCNF)

## ****Section B: Short Answer Questions (20 Marks)****

(Each question carries 5 marks.)

**Define the following database schema types:**

* + **Conceptual Schema:** **High-level database design defining entities and relationships.**
  + **Logical Schema:** **Defines tables, attributes, and constraints without considering physical storage.**
  + **Physical Schema:** **Defines actual storage structures, file formats, and indexing.**

**What are the three levels of data abstraction?**

**Answer:**

* + **Physical Level:** **How data is stored in memory.**
  + **Logical Level:** **What data is stored and relationships between them.**
  + **View Level:** **How users interact with data.**

**List the key components of an ERD and their descriptions.**

**Answer:**

* + **Entities:** **Objects or concepts (e.g., Student, Teacher).**
  + **Attributes:** **Characteristics of an entity (e.g., StudentName, Age).**
  + **Relationships:** **Associations between entities (e.g., "Enrolls" between Student and Course).**
  + **Primary Key:** **Uniquely identifies a record.**

**Define Table Constraints and list four types.**

**Answer:**

* + **Table Constraints:** **Rules enforced on table columns to maintain data integrity.**
  + **Types:**
    - **NOT NULL:** Ensures a column cannot have NULL values.
    - **UNIQUE:** Ensures column values are unique.
    - **PRIMARY KEY:** Uniquely identifies a record in a table.
    - **FOREIGN KEY:** Establishes a relationship between two tables.

**Explain indexing and its importance in databases.**

**Answer:** **Indexing improves database performance by reducing the time needed to search for records. It creates an internal data structure that speeds up queries.**

## ****Section C: Case Study (20 Marks)****

(Each question carries 10 marks.)

### ****Case Study:****

A **university database** needs to store **students, courses, and enrollments**. Each **student** has a **StudentID, Name, and Age**. Each **course** has a **CourseID, Title, and Credits**. Students enroll in multiple courses, and each course has multiple students.

1. **Draw an ERD for this scenario, including entities, attributes, and relationships.** (Manually draw in an exam or use tools like MS-Visio, Draw.io.)

**Answer:** (Manually drawn ERD should include:)

* **Entities:** Student, Course, Enrollment
* **Attributes:**
  + **Student:** StudentID (PK), Name, Age
  + **Course:** CourseID (PK), Title, Credits
  + **Enrollment:** EnrollmentID (PK), StudentID (FK), CourseID (FK)
* **Relationships:**
  + One **student** can enroll in multiple **courses** (Many-to-Many).

1. **Convert the conceptual schema to a logical schema (list the tables with constraints).**

**Answer:**

sql

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CREATE TABLE Students (

StudentID INT PRIMARY KEY,

Name VARCHAR(50),

Age INT NOT NULL

);

CREATE TABLE Courses (

CourseID INT PRIMARY KEY,

Title VARCHAR(100),

Credits INT CHECK (Credits > 0)

);

CREATE TABLE Enrollment (

EnrollmentID INT PRIMARY KEY,

StudentID INT,

CourseID INT,

FOREIGN KEY (StudentID) REFERENCES Students(StudentID),

FOREIGN KEY (CourseID) REFERENCES Courses(CourseID)

);

## ****Section D: SQL Queries (20 Marks)****

(Each question carries 5 marks.)

1. **Write an SQL query to create an index on the "Name" column of the "Students" table.**

sql

CopyEdit

CREATE INDEX idx\_student\_name ON Students(Name);

1. **Write an SQL query to enforce a DEFAULT constraint on the "Credits" column of the "Courses" table (default value = 3).**

sql

CopyEdit

ALTER TABLE Courses

MODIFY COLUMN Credits INT DEFAULT 3;

1. **Write an SQL query to enforce a CHECK constraint ensuring that Age in the "Students" table is greater than 18.**

sql

CopyEdit

ALTER TABLE StudentsADD CONSTRAINT chk\_age CHECK (Age > 18);

1. **Write an SQL query to list all students along with the courses they have enrolled in using JOIN.**

sql

CopyEdit

SELECT Students.Name, Courses.Title FROM EnrollmentJOIN Students ON Enrollment.StudentID = Students.StudentIDJOIN Courses ON Enrollment.CourseID = Courses.CourseID;

## ****Section E: Essay Questions (20 Marks)****

(Each question carries 10 marks.)

1. **Explain the process of data normalization and its importance in database design.**

**Answer:** **Normalization is the process of organizing tables to reduce redundancy and improve integrity.**

* **1NF (First Normal Form):** Eliminates duplicate columns.
* **2NF (Second Normal Form):** Removes partial dependencies.
* **3NF (Third Normal Form):** Eliminates transitive dependencies.  
  **Importance:** Reduces data duplication, improves query performance, and ensures consistency.

1. **Describe the steps to convert a logical database schema into a physical schema in MySQL.**

**Answer:**

1. **Choose a DBMS (MySQL, PostgreSQL, etc.).**
2. **Set up the database environment (install MySQL).**
3. **Write SQL scripts to create tables, relationships, and constraints.**
4. **Implement indexing to optimize searches.**
5. **Test the database with sample data.**

## ****Final Notes****

This exam evaluates **database schema design, normalization, indexing, constraints, and SQL implementation**. Let me know if you need modifications! 😊

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##### You said:

Learning outcome 3: Implement Database Learning hours: 36 Indicative content • Description to SQL ✓ Introduction of SQL ✓ SQL sub-languages ✓ SQL Operators SQL Arithmetic Operators SQL Bitwise Operators SQL Compound Operators SQL Logical Operators • Application of DDL commands ✓ CREATE Database Table Constraints Table ✓ ALTER Table ✓ DROP Database Table ✓ TRUNCATE Table ✓ MODIFY Database Table • Application of DML commands ✓ INSERT 10 | P a g e ✓ UPDATE ✓ DELETE ✓ CALL ✓ EXPLAIN CALL ✓ LOCK • Application of DQL Command ✓ SELECT ✓ SQL aggregate function ✓ SQL clause • Application of DCL commands ✓ GRANT ✓ REVOKE • Application of TCL commands ✓ COMMIT ✓ SAVEPOINT ✓ ROLLBACK ✓ SET Transaction ✓ SET Constraints

###### ChatGPT said:

Here’s a **Database Development Exam** for **Learning Outcome 3: Implement Database**, structured into **Sections A, B, C, D, and E** with **bolded answers**.

# ****Database Development Examination****

**Course Title:** Develop Database  
**Learning Outcome 3:** Implement Database  
**Total Marks:** 100  
**Time:** [Adjust as Needed]

## ****Section A: Multiple Choice Questions (20 Marks)****

(Each question carries 2 marks. Choose the correct answer.)

**Which SQL sub-language is used to create and modify database structures?**  
a) **DDL (Data Definition Language)**  
b) DML (Data Manipulation Language)  
c) DCL (Data Control Language)  
d) TCL (Transaction Control Language)

**Which SQL command is used to remove all rows from a table without deleting the table structure?**  
a) DELETE  
b) **TRUNCATE**  
c) DROP  
d) ALTER

**Which of the following is a DML (Data Manipulation Language) command?**  
a) CREATE  
b) **INSERT**  
c) DROP  
d) GRANT

**Which SQL aggregate function calculates the average value of a numeric column?**  
a) COUNT()  
b) **AVG()**  
c) MAX()  
d) SUM()

**Which SQL command is used to permanently save a transaction in a database?**  
a) ROLLBACK  
b) SAVEPOINT  
c) **COMMIT**  
d) REVOKE

## ****Section B: Short Answer Questions (20 Marks)****

(Each question carries 5 marks.)

**Define the following SQL sub-languages and provide one example command for each:**

* + **DDL (Data Definition Language):** **Used to define database structures (e.g., CREATE TABLE).**
  + **DML (Data Manipulation Language):** **Used to manipulate data (e.g., INSERT INTO).**
  + **DQL (Data Query Language):** **Used to query data (e.g., SELECT).**
  + **DCL (Data Control Language):** **Used for permissions (e.g., GRANT).**
  + **TCL (Transaction Control Language):** **Used for transactions (e.g., COMMIT).**

**List and describe four SQL constraints used in table creation.**

**Answer:**

* + **NOT NULL:** Ensures a column cannot have NULL values.
  + **UNIQUE:** Ensures column values are unique.
  + **PRIMARY KEY:** Uniquely identifies a record in a table.
  + **FOREIGN KEY:** Establishes a relationship between two tables.

**Explain the difference between the DELETE, TRUNCATE, and DROP commands.**

**Answer:**

* + **DELETE:** Removes specific rows from a table (**can be rolled back**).
  + **TRUNCATE:** Removes all rows but keeps the table structure (**cannot be rolled back**).
  + **DROP:** Deletes the entire table from the database (**cannot be rolled back**).

**What are SQL aggregate functions? Provide three examples.**

**Answer:** **Aggregate functions perform calculations on a set of values and return a single value.**

* + **SUM():** Returns the total sum of a numeric column.
  + **COUNT():** Returns the number of rows.
  + **MAX():** Returns the highest value in a column.

**Explain the purpose of the GRANT and REVOKE commands.**

**Answer:**

* **GRANT:** **Gives specific privileges to users (e.g., GRANT SELECT ON table\_name TO user).**
* **REVOKE:** **Removes privileges from users (e.g., REVOKE SELECT ON table\_name FROM user).**

## ****Section C: Case Study (20 Marks)****

(Each question carries 10 marks.)

### ****Case Study:****

A **library management system** needs to store **books, authors, and borrowers**.  
Each **book** has a **BookID, Title, and AuthorID**.  
Each **author** has an **AuthorID, Name, and Country**.  
Each **borrower** has a **BorrowerID, Name, and BookID (foreign key)**.

1. **Write SQL commands to create the three required tables with constraints.**

**Answer:**

sql

CopyEdit

CREATE TABLE Authors (

AuthorID INT PRIMARY KEY,

Name VARCHAR(100),

Country VARCHAR(50)

);

CREATE TABLE Books (

BookID INT PRIMARY KEY,

Title VARCHAR(150),

AuthorID INT,

FOREIGN KEY (AuthorID) REFERENCES Authors(AuthorID)

);

CREATE TABLE Borrowers (

BorrowerID INT PRIMARY KEY,

Name VARCHAR(100),

BookID INT,

FOREIGN KEY (BookID) REFERENCES Books(BookID)

);

1. **Write SQL queries to:**

* Insert a new book into the Books table.
* Update an author's country.
* Delete a borrower from the Borrowers table.

**Answer:**

sql

CopyEdit

INSERT INTO Books (BookID, Title, AuthorID) VALUES (1, 'Database Fundamentals', 101);

UPDATE Authors SET Country = 'USA' WHERE AuthorID = 101;

DELETE FROM Borrowers WHERE BorrowerID = 5;

## ****Section D: SQL Queries (20 Marks)****

(Each question carries 5 marks.)

1. **Write an SQL query to retrieve all books written by an author from the "USA".**

sql

CopyEdit

SELECT Books.Title FROM BooksJOIN Authors ON Books.AuthorID = Authors.AuthorIDWHERE Authors.Country = 'USA';

1. **Write an SQL query to count the total number of books in the Books table.**

sql

CopyEdit

SELECT COUNT(\*) FROM Books;

1. **Write an SQL query to lock the Books table for update operations.**

sql

CopyEdit

LOCK TABLE Books WRITE;

1. **Write an SQL query to rollback a transaction if an error occurs during an insert operation.**

sql

CopyEdit

START TRANSACTION;INSERT INTO Books (BookID, Title, AuthorID) VALUES (2, 'SQL Basics', 102);ROLLBACK;

## ****Section E: Essay Questions (20 Marks)****

(Each question carries 10 marks.)

1. **Discuss the importance of transaction control in databases and describe the four main TCL commands.**

**Answer:** **Transaction control ensures consistency, integrity, and recovery in databases.**

* **COMMIT:** **Saves all changes to the database.**
* **ROLLBACK:** **Undoes changes if an error occurs.**
* **SAVEPOINT:** **Creates a checkpoint to which a transaction can be rolled back.**
* **SET TRANSACTION:** **Defines properties like isolation level for a transaction.**

1. **Explain SQL indexing and its impact on database performance.**

**Answer:** **Indexing improves query performance by creating a structured lookup mechanism.**

* **Advantages:**
  + Speeds up search queries.
  + Reduces disk I/O operations.
* **Disadvantages:**
  + Consumes additional storage.
  + Slows down insert/update operations.

## ****Final Notes****

This exam covers **SQL implementation, DDL/DML/DQL/DCL/TCL commands, indexing, constraints, and transactions**. Let me know if you need modifications! 😊

4o

##### You said:

Learning outcome 3: Implement Database Learning hours: 36 Indicative content • Description to SQL ✓ Introduction of SQL ✓ SQL sub-languages ✓ SQL Operators SQL Arithmetic Operators SQL Bitwise Operators SQL Compound Operators SQL Logical Operators • Application of DDL commands ✓ CREATE Database Table Constraints Table ✓ ALTER Table ✓ DROP Database Table ✓ TRUNCATE Table ✓ MODIFY Database Table • Application of DML commands ✓ INSERT 10 | P a g e ✓ UPDATE ✓ DELETE ✓ CALL ✓ EXPLAIN CALL ✓ LOCK • Application of DQL Command ✓ SELECT ✓ SQL aggregate function ✓ SQL clause • Application of DCL commands ✓ GRANT ✓ REVOKE • Application of TCL commands ✓ COMMIT ✓ SAVEPOINT ✓ ROLLBACK ✓ SET Transaction ✓ SET Constraints

###### ChatGPT said:

Here is a structured **Database Development Examination** for **Learning Outcome 3: Implement Database**, formatted into **Sections A, B, C, D, and E** with **bolded answers**.

# ****Database Development Examination****

**Course Title:** Develop Database  
**Learning Outcome 3:** Implement Database  
**Total Marks:** 100  
**Time:** [Adjust as Needed]

## ****Section A: Multiple Choice Questions (20 Marks)****

(Each question carries 2 marks. Choose the correct answer.)

**Which of the following is NOT a SQL sub-language?**  
a) **HTML**  
b) DDL  
c) DCL  
d) TCL

**Which SQL operator is used to compare two values and return true if they are equal?**  
a) !=  
b) **=**  
c) <>  
d) LIKE

**Which DDL command is used to permanently delete a database?**  
a) TRUNCATE  
b) DELETE  
c) **DROP**  
d) MODIFY

**Which SQL statement is used to update existing records in a table?**  
a) INSERT  
b) **UPDATE**  
c) ALTER  
d) TRUNCATE

**Which of the following is a TCL (Transaction Control Language) command?**  
a) CREATE  
b) INSERT  
c) **COMMIT**  
d) DROP

## ****Section B: Short Answer Questions (20 Marks)****

(Each question carries 5 marks.)

**What are the different SQL sub-languages?**  
**Answer:**

* + **DDL (Data Definition Language)** – Used to define database structures (**CREATE, ALTER, DROP**)
  + **DML (Data Manipulation Language)** – Used to modify database records (**INSERT, UPDATE, DELETE**)
  + **DQL (Data Query Language)** – Used for data retrieval (**SELECT**)
  + **DCL (Data Control Language)** – Used to control user access (**GRANT, REVOKE**)
  + **TCL (Transaction Control Language)** – Used to manage transactions (**COMMIT, ROLLBACK, SAVEPOINT**)

**Describe four types of SQL operators with examples.**  
**Answer:**

* + **Arithmetic Operators:** Perform calculations (**e.g., SELECT 5 + 3;**)
  + **Logical Operators:** Compare values (**e.g., WHERE age > 18 AND status = 'Active'**)
  + **Comparison Operators:** Compare two values (**e.g., SELECT \* FROM users WHERE age = 30;**)
  + **Bitwise Operators:** Perform bitwise operations (**e.g., SELECT 5 & 3;**)

**Explain the difference between DROP, DELETE, and TRUNCATE.**  
**Answer:**

* + **DROP:** Removes a table/database completely. (**Cannot be rolled back**)
  + **DELETE:** Removes specific rows from a table. (**Can be rolled back**)
  + **TRUNCATE:** Removes all rows but keeps the table structure. (**Cannot be rolled back**)

**List and describe two SQL aggregate functions with examples.**  
**Answer:**

* + **SUM():** Returns the sum of a column (**e.g., SELECT SUM(price) FROM products;**)
  + **COUNT():** Returns the number of records (**e.g., SELECT COUNT(\*) FROM employees;**)

**What is the purpose of the GRANT and REVOKE commands?**  
**Answer:**

* **GRANT:** Assigns privileges to a user (**e.g., GRANT SELECT ON users TO admin;**)
* **REVOKE:** Removes privileges from a user (**e.g., REVOKE SELECT ON users FROM admin;**)

## ****Section C: Case Study (20 Marks)****

(Each question carries 10 marks.)

### ****Case Study:****

A company wants to store information about its **employees, departments, and projects**.

* Each **employee** has an **EmployeeID, Name, and DepartmentID**.
* Each **department** has a **DepartmentID, Name, and ManagerID**.
* Each **project** has a **ProjectID, Name, and EmployeeID (foreign key)**.

1. **Write SQL commands to create these three tables with constraints.**

**Answer:**

sql

CopyEdit

CREATE TABLE Departments (

DepartmentID INT PRIMARY KEY,

Name VARCHAR(100),

ManagerID INT

);

CREATE TABLE Employees (

EmployeeID INT PRIMARY KEY,

Name VARCHAR(100),

DepartmentID INT,

FOREIGN KEY (DepartmentID) REFERENCES Departments(DepartmentID)

);

CREATE TABLE Projects (

ProjectID INT PRIMARY KEY,

Name VARCHAR(100),

EmployeeID INT,

FOREIGN KEY (EmployeeID) REFERENCES Employees(EmployeeID)

);

1. **Write SQL queries to:**

* Insert a new employee into the Employees table.
* Update a department’s name.
* Delete a project from the Projects table.

**Answer:**

sql

CopyEdit

INSERT INTO Employees (EmployeeID, Name, DepartmentID) VALUES (1, 'John Doe', 101);

UPDATE Departments SET Name = 'Finance' WHERE DepartmentID = 101;

DELETE FROM Projects WHERE ProjectID = 5;

## ****Section D: SQL Queries (20 Marks)****

(Each question carries 5 marks.)

1. **Write an SQL query to retrieve all employees who work in the "IT" department.**

sql

CopyEdit

SELECT Employees.Name FROM EmployeesJOIN Departments ON Employees.DepartmentID = Departments.DepartmentIDWHERE Departments.Name = 'IT';

1. **Write an SQL query to count the total number of employees in the Employees table.**

sql

CopyEdit

SELECT COUNT(\*) FROM Employees;

1. **Write an SQL query to lock the Employees table for update operations.**

sql

CopyEdit

LOCK TABLE Employees WRITE;

1. **Write an SQL query to rollback a transaction if an error occurs during an insert operation.**

sql

CopyEdit

START TRANSACTION;INSERT INTO Employees (EmployeeID, Name, DepartmentID) VALUES (2, 'Jane Doe', 102);ROLLBACK;

## ****Section E: Essay Questions (20 Marks)****

(Each question carries 10 marks.)

1. **Discuss the importance of transaction control in databases and describe the four main TCL commands.**

**Answer:** **Transaction control ensures data consistency and integrity in databases.**

* **COMMIT:** Saves changes permanently.
* **ROLLBACK:** Reverts changes in case of an error.
* **SAVEPOINT:** Creates checkpoints for partial rollbacks.
* **SET TRANSACTION:** Defines properties like isolation level.

1. **Explain SQL indexing and its impact on database performance.**

**Answer:** **Indexing speeds up data retrieval by creating an optimized search mechanism.**

* **Advantages:**
  + Improves query performance.
  + Reduces disk I/O operations.
* **Disadvantages:**
  + Requires additional storage.
  + Slows down insert/update operations.

## ****Final Notes****

This exam covers **SQL sub-languages, operators, constraints, DDL/DML/DQL/DCL/TCL commands, indexing, constraints, and transactions**. Let me know if you need adjustments! 😊

4o

##### You said:

Learning outcome 4: Implement Database security Learning hours: 19 Indicative content • Enforcement of data access control ✓ Description of database security Introduction of database security Types of database security ✓ Data access control ✓ Access control policies Identify the data classifications Define roles and permission ✓ Authentication Identify user accounts Create privileges Configure the authentication system Test the authentication system Monitor and maintain ✓ Authorization Create roles 12 | P a g e Assign permissions/privilege to roles Assign roles to users Test the authorisation system Monitor and maintain • Management of Auditing and logging ✓ Logging Identify the logging requirements Configure logging settings Monitor log data Analyse log data Archive log data Corrective action ✓ Auditing Identify the data that needs to be audited Execution of SQL command Configure audit settings Review audit Analyse audit data Corrective action • Implementation of Data encryption ✓ Description of data encryption ✓ Application of encryption technics Symmetric Encryption Asymmetric Encryption Hashing • Configuration of database backup and restore ✓ Introduction of data backup and restore ✓ Backup Method 13 | P a g e Full backup Differential backup Incremental backup ✓ Backup schedule ✓ Create Backup ✓ Perform recovery method Full database recovery Rollback recovery Point-in-time recovery ✓ Test your backup and recovery plan

###### ChatGPT said:

Here is a **structured Database Security Examination** for **Learning Outcome 4: Implement Database Security**, formatted into **Sections A, B, C, D, and E** with **bolded answers**.

# ****Database Security Examination****

**Course Title:** Develop Database  
**Learning Outcome 4:** Implement Database Security  
**Total Marks:** 100  
**Time:** [Adjust as Needed]

## ****Section A: Multiple Choice Questions (20 Marks)****

(Each question carries 2 marks. Choose the correct answer.)

**What is the primary purpose of database security?**  
a) Increase database performance  
b) **Protect data from unauthorized access and loss**  
c) Reduce database size  
d) Improve indexing

**Which of the following is NOT a type of database security?**  
a) Access control  
b) Encryption  
c) **Normalization**  
d) Authentication

**Which of the following authentication methods ensures that only authorized users can access the database?**  
a) **Username and password**  
b) Database indexing  
c) Query optimization  
d) Data normalization

**Which of the following is an example of asymmetric encryption?**  
a) **RSA**  
b) AES  
c) DES  
d) Blowfish

**What type of database backup saves only the changes made since the last full backup?**  
a) **Differential backup**  
b) Incremental backup  
c) Full backup  
d) Real-time backup

## ****Section B: Short Answer Questions (20 Marks)****

(Each question carries 5 marks.)

**What are the different types of database security?**  
**Answer:**

* + **Access control:** Restricting user permissions.
  + **Authentication:** Verifying user identity.
  + **Authorization:** Assigning permissions to users.
  + **Encryption:** Protecting data using encryption methods.
  + **Auditing & Logging:** Monitoring database activities.

**What are the key components of an authentication system?**  
**Answer:**

* + **User accounts:** Unique identifiers for users.
  + **Privileges:** Permissions assigned to users.
  + **Authentication system configuration:** Ensuring proper security settings.
  + **Testing and monitoring:** Verifying and maintaining authentication.

**Explain the difference between authentication and authorization.**  
**Answer:**

* + **Authentication:** Process of verifying user identity (**e.g., username & password**).
  + **Authorization:** Granting permissions to authenticated users (**e.g., admin vs. regular user access**).

**Describe the purpose of logging in database security.**  
**Answer:**

* + **Logging helps track user activities, detect anomalies, and investigate security incidents.**
  + **It includes capturing login attempts, failed queries, and system changes.**
  + **Logs should be monitored, analyzed, and archived for security.**

**List and explain three database backup methods.**  
**Answer:**

* **Full Backup:** Backs up the entire database.
* **Differential Backup:** Backs up changes since the last full backup.
* **Incremental Backup:** Backs up changes since the last backup (full or differential).

## ****Section C: Case Study (20 Marks)****

(Each question carries 10 marks.)

### ****Case Study:****

A **bank database** stores **customer account information, transactions, and employee records**. To improve security, the bank must implement **access control, authentication, and encryption**.

1. **Write SQL commands to create two roles (Admin and Teller), assign permissions, and grant the roles to users.**

**Answer:**

sql

CopyEdit

CREATE ROLE Admin;CREATE ROLE Teller;

GRANT ALL PRIVILEGES ON bank\_db.\* TO Admin;GRANT SELECT, INSERT, UPDATE ON bank\_db.accounts TO Teller;

GRANT Admin TO 'bank\_manager';GRANT Teller TO 'cashier1';

1. **The bank wants to enable logging for login attempts and failed transactions. What steps should they take?**

**Answer:**

* **Identify logging requirements** (e.g., logins, failed transactions).
* **Configure logging settings** in the database server.
* **Monitor and analyze logs** for unusual activity.
* **Archive log data** for security auditing.
* **Take corrective action** on suspicious activity.

## ****Section D: SQL Queries (20 Marks)****

(Each question carries 5 marks.)

1. **Write an SQL query to create a user account and grant read-only access to a database.**

sql

CopyEdit

CREATE USER 'readonly\_user'@'localhost' IDENTIFIED BY 'securepassword';GRANT SELECT ON mydatabase.\* TO 'readonly\_user'@'localhost';

1. **Write an SQL query to enable logging of failed login attempts.**

sql

CopyEdit

SET GLOBAL log\_warnings = 2;

1. **Write an SQL query to create a backup of the database named** company\_db**.**

sql

CopyEdit

BACKUP DATABASE company\_db TO DISK = 'C:\Backup\company\_db.bak';

1. **Write an SQL query to restore the** company\_db **database from a backup.**

sql

CopyEdit

RESTORE DATABASE company\_db FROM DISK = 'C:\Backup\company\_db.bak';

## ****Section E: Essay Questions (20 Marks)****

(Each question carries 10 marks.)

1. **Explain the importance of database auditing and describe the audit process.**

**Answer:**

* **Database auditing ensures security, regulatory compliance, and fraud prevention.**
* **The audit process involves:**
  + Identifying data to be audited.
  + Configuring audit settings.
  + Reviewing and analyzing audit logs.
  + Taking corrective action.

1. **Discuss encryption in database security and compare symmetric and asymmetric encryption.**

**Answer:**

* **Encryption protects data by transforming it into unreadable formats.**
* **Symmetric encryption:**
  + Uses a single key for encryption and decryption.
  + **Example:** AES, DES.
* **Asymmetric encryption:**
  + Uses public and private keys for encryption and decryption.
  + **Example:** RSA, ECC.

## ****Final Notes****

This exam covers **database security, authentication, authorization, auditing, logging, encryption, and backup methods**. Let me know if you need modifications! 😊