CONCEPTUAL MODEL:

1.Entities and Attributes:

• Discuss the entities (Student, Course, Professor) and their attributes (e.g., StudentID, Name, CourseID, Title).

• Emphasize the importance of choosing relevant attributes based on the requirements.

Answer:

In the conceptual, we identify key entities that represent the main components of our system. Each entity has specific that provide detailed information about it.

- Students

Attributes: StudentID, Name, Email, DateofBirth

Student

- Course

Attributes: CourseID, Title, Credits, Semester

- Professor

Attributes: ProfessorID, Name, Department.

2.Relationships:

• Explain the relationships between entities (Enrolls in, Offered by, Teaches).

• Discuss the cardinality and participation constraints. For example, a student may be enrolled in zero or more courses, but a course must have at least one enrolled student.

Answer:

Relationship

- Enrolls in: A student can enroll in zero
- Offered by: A course is offered by 1 professor, a professor can offer zero and N courses.
- Teaches: A professor can teach zero. A course must be taught by 1 professor.

3.Scenario:

• Walk through the example scenario involving Alice, the courses she's enrolled in, and the professor who teaches one of those courses.

Answer: Alice is a student enrolled in Database System and Web development taught by Professor Jensen Santillan.

4.ERD:

• Explain the visual representation (ERD) and how it captures the entities, attributes, and relationships.

• Highlight the use of primary keys (PK) and foreign keys (FK) to establish relationships between tables.

Answer:

Visual representation for the ERD shows entities as rectangle, relationships as diamonds with primary keys and foreign keys indicated.

LOGICAL MODEL

1.Entities and Attributes:

• Discuss the entities (Book, Author, Publisher, LibraryMember, LibraryLoan) and their attributes.

• Emphasize the use of primary keys (PK) to uniquely identify records within each entity.

Answer:

Entities:

- Book

Attributes: BookID (Primary Key), Title, PublishedYear.

- Author

Attributes: AuthorID(Primary Key), Name, Bio

- Publisher

Attributes: PublisherName(Primary Key), Name, Address.

- LibraryMember

Attributes: MemberID (Primary Key), Name, MembershipID

- LibraryLoan

Attributes: LoanID (Primary Key), LoanDate, ReturnDate

2.Relationships:

• Explain the relationships between entities (Author-Writes-Book, Book-Published-By Publisher, LibraryMember-Checks-Out-Book).

• Discuss the cardinality and participation constraints. For example, an author can write multiple books, but a book must have at least one author.

Answer:

- Author-Writes-Book

An author can write one books, A books must have one author

- Book-Publish-By Publisher

A book is published by one publisher, a publisher can publish

- LibraryMember-Checks-Out-Book

A library member can check out book, A book can check out by zero

3.Foreign Keys:

• Highlight the use of foreign keys (FK) to establish relationships between tables by referencing

• Discuss how foreign keys create links between related entities.

Answer:

Foreign Keys are used to establish relationships between tables by referencing primary keys in related entities.

4.Logical Constraints:

• Mention any logical constraints imposed on the model, such as uniqueness constraints on primary keys or referential integrity constraints.

Answer:

Uniqueness constraints – primary keys must be unique within their respective table, ensuring that no two records can have the same identifier.

5.Normalization:

• Discuss how the logical data model adheres to principles of normalization, avoiding redundancy and ensuring data consistency.

Answer:

Normalization – the logical data model adheres to normalization principles, which aim to reduce data redundancy and improve data integrity. For example by separating authors, book and publisher into distinct entities.

PHYSICAL MODEL

1.Data Types:

• Discuss the selection of appropriate data types for each attribute based on the nature of the data.

Answer:

Selecting appropriate data types for each attribute is crucial for optimizing storage and ensuring data integrity.

2. Indexes:

• Explain the use of indexes to optimize query performance and facilitate faster data retrieval.

Answer:

Indexes are used to optimize query performance and facilitate faster data retrieval. Commonly indexed field includes primary keys and foreign keys

3. Constraints:

• Emphasize the importance of constraints in maintaining data integrity, such as primary key and foreign key constraints.

Answers:

Constraints are essential for maintaining data integrity within database. Primary Key Constraints ensure that each record in table is unique while Foreign key constraints ensure that relationship between tables are valid and that references record exists.

4. Normalization:

• Discuss how the physical data model adheres to normalization principles, minimizing data redundancy.

Answer:

The physical data model adheres to normalization principles by minimizing data redundancy and ensuring that the data is stored efficiently. By organizing data into separate tables using foreign keys, the model avoid duplication and maintains consistency across related records

5. Storage Considerations:

• Mention considerations related to file organization and storage optimization.

Answer:

- Choosing appropriate storage engines example: any framework DB for MySQL, that support transactions and foreign key constraints.
- Implementing partitioning strategies for large tables to improve performance.
- Regularly monitoring and optimizing database performance through indexing and query optimization techniques.

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