TD1: solutions

Questions and Answers

1. Basic Concepts

Q1: What is a database?
A1: A database is an organized collection of data that can be easily accessed, managed, and updated.

Q2: What is a field in a table?
A2: A field (or column) represents an attribute of the data, such as Name or GPA in a Students table.

Q3: What is a record in a table?
A3: A record (or row) is a single entry in a table that contains data for all the fields.

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2. Primary Keys

Q4: What is the purpose of a primary key in a table?
A4: The primary key ensures that each record in the table is unique and can be identified independently.

Q5: Can a table have multiple primary keys?
A5: No, a table can only have one primary key, but the primary key can consist of multiple fields. This is called a **composite primary key**.

Q6: Give an example of when a composite primary key might be used.
A6: In a table Enrollments storing which students are enrolled in which courses, both StudentID and CourseID together could be the primary key because a student can take multiple courses, and a course can have multiple students.

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3. Foreign Keys

Q7: What is the purpose of a foreign key?
A7: A foreign key is used to establish a relationship between two tables by referencing the primary key of another table.

Q8: Give an example of a foreign key relationship.
A8: In a table Enrollments(StudentID, CourseID), the StudentID field can be a foreign key referencing the StudentID in the Students table.

Q9: Can a table have more than one foreign key?
A9: Yes, a table can have multiple foreign keys, each referencing primary keys in different tables.

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4. Practical Scenarios

Q10: Suppose you have two tables:

- Customers(CustomerID, Name, Email)
- Orders(OrderID, CustomerID, Amount)

What is the primary key and foreign key in the Orders table?
A10: The primary key is OrderID, and the foreign key is CustomerID, which references the CustomerID in the Customers table.

Q11: Why is it important to enforce foreign key constraints in a database?
A11: Enforcing foreign key constraints ensures referential integrity, meaning that a foreign key value in one table must exist as a primary key value in the related table.

Q12: What happens if you try to delete a row in a table that is referenced by a foreign key in another table?
A12: If the foreign key constraint is enforced, the deletion will fail unless cascading rules like ON DELETE CASCADE are set.

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5. Unique and Null Values

Q13: What is the difference between a Primary Key and a Unique constraint?
A13: Both enforce uniqueness, but a primary key also does not allow null values, whereas a unique constraint can have one null value in a column.

Q14: Can a primary key column have null values?
A14: No, a primary key column cannot have null values because every record must have a unique and valid identifier.

Q15: Can a foreign key column have null values?
A15: Yes, a foreign key column can have null values if the relationship is optional.

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6. Data Types

Q16: Why is it important to choose the correct data type for a column?
A16: Choosing the correct data type ensures that the data stored is accurate, reduces storage space, and improves performance.

Q17: Give an example of a column and its appropriate data type.
A17: For storing student ages, the data type could be an integer. For student names, the data type could be text or varchar.

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7. Relationships

Q18: What are the types of relationships in databases?
A18: The three main types of relationships are:

- **One-to-One:** One record in Table A is related to one record in Table B.
- **One-to-Many:** One record in Table A is related to multiple records in Table B.
- **Many-to-Many:** Multiple records in Table A are related to multiple records in Table B.

Q19: Which type of relationship is established between Students and Courses if students can enroll in multiple courses, and each course can have multiple students?
A19: A many-to-many relationship.

Q20: How is a many-to-many relationship typically represented in a database?
A20: It is represented using a junction table (e.g., Enrollments), which includes foreign keys from both tables involved.

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8. Constraints

Q21: What are database constraints?
A21: Constraints are rules applied to columns to ensure data integrity. Examples include Primary Key, Foreign Key, Unique, Not Null, and Check.

Q22: What does the Not Null constraint do?
A22: The Not Null constraint ensures that a column cannot have a null value.

Q23: What is the purpose of a Default constraint?
A23: The Default constraint provides a default value for a column if no value is specified during record insertion.

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9. Practical Scenarios

Q24: Imagine a table Students with the following fields:

- StudentID (Primary Key)
- Name
- Major
- GPA

What would be the primary key, and why?
A24: The primary key is StudentID because it uniquely identifies each student in the table.

Q25: Suppose we have two tables:

- Students(StudentID, Name, Major)
- Courses(CourseID, CourseName, Instructor)

How would you create a table to store the courses that each student is taking?
A25: You can create a table Enrollments with the following fields:

- EnrollmentID (Primary Key)
- StudentID (Foreign Key referencing Students)
- CourseID (Foreign Key referencing Courses)

Q26: Which of the following can be used as a primary key in a Sales table?
A) Customer Name
B) Invoice Number
C) Product Description
D) Total Amount

A26: B) Invoice Number (because it uniquely identifies each sale).

Q27: In a database, which constraint ensures that a column cannot have duplicate values?
A) Foreign Key
B) Default
C) Unique
D) Not Null

A27: C) Unique.