08 Referential Integrity

It is a property that guarantees that relationships between tables remain consistent. In simpler terms, referential integrity ensures that a foreign key in one table matches a primary key in another table, preventing orphaned records and maintaining logical relationships between tables.

Key Concepts

1. **Primary Key**: A unique identifier for a record in a table.
2. **Foreign Key**: The foreign key is defined in a second table, but it refers to the primary key or a unique key in the first table.

Referential Integrity Constraints

- **Foreign Key Constraint**: Ensures that the value in a foreign key column must match an existing value in the referenced primary key column.

Example 1: Basic Referential Integrity
Customers Table:

CustomerID	CustomerName
1	Alice
2	Bob

Orders Table:

OrderID	CustomerID	OrderDate
100	1	2023-01-15
101	2	2023-01-16

In this example:

- `CustomerID` is the primary key in the `Customers` table.
- `CustomerID` in the `Orders` table is a foreign key that references `CustomerID` in the `Customers` table.

Referential integrity ensures that every `CustomerID` value in the `Orders` table matches a valid `CustomerID` in the `Customers` table. For instance, if you try to insert a record into the `Orders` table with `CustomerID = 3`, it will be rejected because there is no matching `CustomerID` in the `Customers` table.

- **Actions on Foreign Keys**:
  - **CASCADE**: If a primary key is updated or deleted, the corresponding foreign key values are also updated or deleted.

Example 2: CASCADE Update/Delete

Using the same tables, consider the following referential integrity constraint:

```
ALTER TABLE Orders
ADD CONSTRAINT fk_customer FOREIGN KEY (CustomerID) REFERENCES Customers (CustomerID)
ON DELETE CASCADE
ON UPDATE CASCADE;
```

With this constraint:

- **ON DELETE CASCADE**: If a customer is deleted from the `Customers` table, all their orders in the `Orders` table will also be deleted automatically.
- **ON UPDATE CASCADE**: If a `CustomerID` is updated in the `Customers` table, the corresponding `CustomerID` in the `Orders` table will be updated automatically.

For example, if you delete the customer with `CustomerID = 1` from the `Customers` table, the order with `OrderID = 100` will also be deleted from the `Orders` table.

- **SET NULL**: If a primary key is updated or deleted, the corresponding foreign key values are set to NULL.
- **SET DEFAULT**: If a primary key is updated or deleted, the corresponding foreign key values are set to their default value.
- **NO ACTION**: Ensures that the update or delete action on a primary key will be rejected if there are matching foreign key values.
- **RESTRICT**: Similar to NO ACTION but typically enforced immediately.

01.1 Referential Integrity Full Code