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Database Management Systems

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INTEGRITY CONSTRAINTS

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DEFINITION OF CONSTRAINTS

- **A constraint is a restriction.**
- **Placed at either column or table level.**
- **A constraint ensures that your data meets certain data integrity rules.**
- **It is a relationship among data elements that the DBMS is required to enforce .**

WHY CONSTRAINTS ARE NEEDED

- **Overall need of constraints arises due to the problem of data inconsistency. In order to ensure consistent data we require certain checks so that consistency can be maintained.**

- **The use of constraints prevents the invalid data entry into the database.**

TYPES OF INTEGRITY CONSTRAINTS

- Entity Integrity Constraint
  - * Primary Key Constraint
  - * Unique Key Constraint
- Referential Integrity Constraint
  - * Foreign Key Constraint
- Domain Integrity Constraint
  - * Not Null Constraint
  - * Check Constraint

Entity Integrity Constraint

- **Entity integrity constraint is concerned with field level as well as table level constraint.**

- **Each row must have unique column or combination of columns called Keys.**

Primary Key Constraint

- A primary key constraint creates a primary key for the table.

- Primary key is a column or a set of columns that uniquely identifies a row. Its main purpose is the Record Uniqueness.

- This constraint ensures that no column that is the part of primary key can contain a null value.

Primary Key Constraint(Contd...)

- **Only one primary key can be created for each table.**
- **A composite primary key can be created by using table level definition.**
- **Primary key is not compulsory but it is recommended.**

Example of Primary Key

```
CREATE TABLE Product (prod_id CHAR(10)
PRIMARY KEY, name CHAR(30), category
VARCHAR(20));
```

OR

```
CREATE TABLE Product (prod_id CHAR(10),
name CHAR(30),category VARCHAR(20),
PRIMARY KEY (prod_id));
```

Example Of Composite Primary Key

```
CREATE TABLE Product (prod_id CHAR(10), name
CHAR(30), category VARCHAR(20),
price NUMBER(8,2), PRIMARY KEY
(prod_id,name));
```

Unique Key Constraint

- Unique key constraint designates any column to accept only unique value that is it does not allow duplicate values.

- Unique key constraint permits multiple entries of NULL into the column.

- A table can have more than one Unique key which is not possible in primary key.

Example Of Unique Key Constraint

```
CREATE TABLE Product (name CHAR(30)
UNIQUE, category VARCHAR(20));
```

OR

```
CREATE TABLE Product (name
CHAR(30),category VARCHAR(20)
UNIQUE (name));
```

Example Of Composite Unique Key

```
CREATE TABLE Product (prod_id CHAR(10),
name CHAR(30), category VARCHAR(20), price
NUMBER(8,2), UNIQUE (prod_id,name));
```

Referential Integrity Constraint

- **Whenever a parent child relationship is needed between two or more entities then referential integrity constraints are used.**

- **Referential integrity constraint can be applied either on table level or column level.**

Foreign Key Constraint

- Foreign key is a column or a group of columns whose values are derived from the primary key or unique key of same table or some other table.
- The table in which the Foreign Key is defined is called a FOREIGN TABLE or CHILD TABLE.
- The table in which the Primary or Unique Key is defined and is referenced by the Foreign Key is called the PRIMARY TABLE or PARENT TABLE.

Foreign Key Constraint(Contd...)

- **Composite foreign key must be created by using a table level definition.**

- **REFERENCES key word is used to define a foreign key constraint.**

Example Of Foreign Key Constraint

```
CREATE TABLE Purchase (prodName
CHAR(30) REFERENCES Product(name),
store CHAR(30));
```

Product

Name	Category
Gizmo	gadget
Camera	Photo
OneClick	Photo

Purchase

ProdName	Store
Gizmo	Wiz
Camera	Ritz
Camera	Wiz

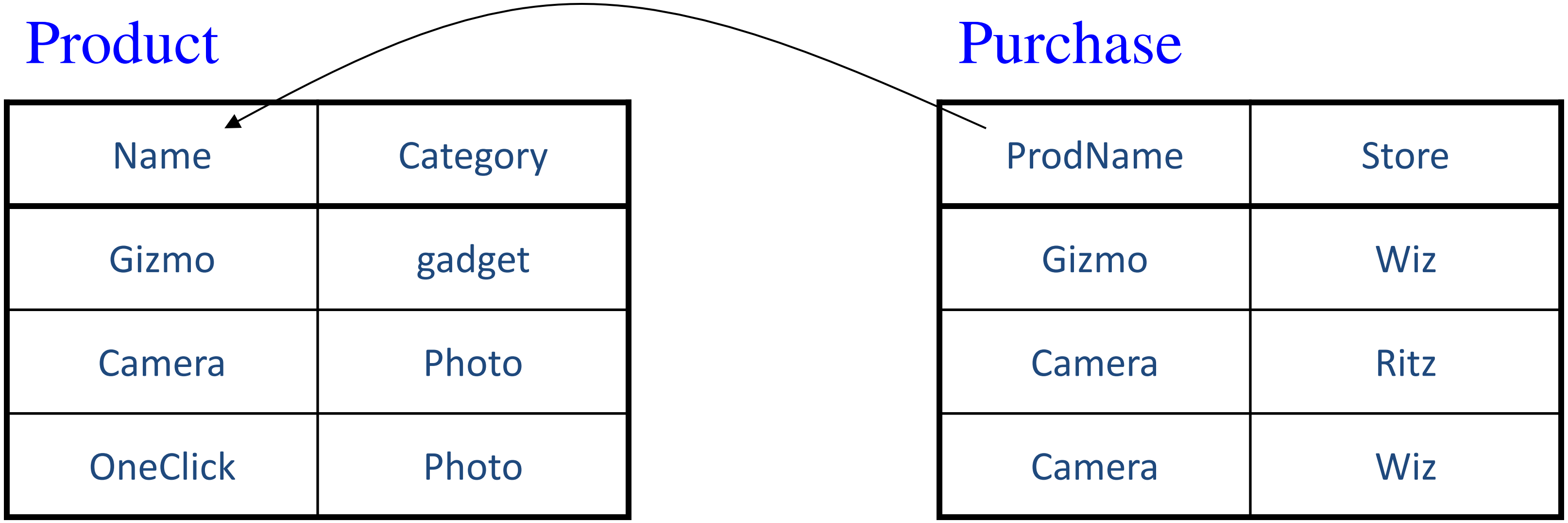
OR

```
CREATE TABLE Purchase (prodName
CHAR(30),category VARCHAR(20),date
DATETIME,FOREIGN KEY (prodName,
category) REFERENCES  Product(name,
category)
```

What happens during updates ?

Types of updates which can cause violations :

- **In Purchase: insert/update**
- **In Product: delete/update**



Product

Name	Category
Gizmo	gadget
Camera	Photo
OneClick	Photo

Purchase

ProdName	Store
Gizmo	Wiz
Camera	Ritz
Camera	Wiz

What happens during updates ?

- SQL has three policies for maintaining referential integrity:
  - Reject: violating modifications (default)
  - Cascade: after a delete/update do a delete/update
  - Set-null: set foreign-key field to NULL

Domain Integrity Constraints

Domain integrity constraints are of two types :-

- NOT NULL Constraint
- CHECK Constraint

NOT NULL CONSTRAINT

- **The NOT NULL constraint ensures that a table column can not be left empty.**

- **The NOT NULL constraint can only be applied at the column level.**

EXAMPLE OF NOT NULL CONSTRAINT

```
CREATE TABLE Product (prod_id CHAR
 (10) NOT NULL, name CHAR(30), category
    VARCHAR(20));
```

CHECK CONSTRAINT

- Whenever it is needed to check a particular value or range of values with a field then CHECK Constraint is used.
- Check constraints allow users to restrict possible attribute values for columns to admissible ones.
- They can be specified as column constraints or table constraints.
- If a check constraint is specified as a column constraint, the condition can only refer that column.

EXAMPLE OF CHECK CONSTRAINT

Example:

-The name of an employee must consist of upper case letters only.

-The minimum salary of an employee is 500.

-Department numbers must range between 10 and 100.

```
CREATE TABLE Emp (empno NUMBER(6), ename
VARCHAR2(30) CHECK( ename = UPPER(ename) ),
 sal NUMBER CHECK( sal >= 500 ), deptno NUMBER
CHECK(deptno BETWEEN 10 AND 100) );
```

NAMING OF CONSTRAINTS

- When constraints are defined, ORACLE assigns a unique name to each constraint.

- The convention used by ORACLE is SYS_Cn where n is a neumeric value that makes constraint name unique.

- Constraints can also be given a unique user defined name along with the constraint definition.

Example of Naming A Constraint

```
CREATE TABLE Product (prod_id CHAR(10)
CONSTRAINT cons_pk_pid PRIMARY KEY,
name CHAR(30), category VARCHAR(20));
```

Modifying Constraints Through ALTER TABLE Command

- Constraints can be defined using the CONSTRAINTS clause in the ALTER TABLE command.

- Constraints defined using ALTER TABLE command are not applicable to the table if data previously placed in the table violates such constraints.

Example Of Modifying Constraints Through ALTER TABLE Command

```
ALTER TABLE product ADD PRIMARY
KEY(prod_id);
```

OR

```
ALTER TABLE product ADD CONSTRAINT
cons_pk_pid PRIMARY KEY(prod_id);
```

Dropping constraints via ALTER TABLE command

- **Constraints can be dropped if**

  - the rule that it enforces is no longer true

  - the constraint is no longer needed

- **Constraint can be dropped using the ALTER TABLE command with the DROP clause.**

Example Of Dropping Constraint Through ALTER TABLE Command

```
ALTER TABLE product DROP PRIMARY KEY;
```

OR

```
ALTER TABLE product DROP CONSTRAINT cons_pk_pid;
```

Reference Books

- Fundamentals of Database Systems by R.Elmasri and S.B.Navathe, 3rd Edition, Pearson Education, New Delhi.
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- SQL / PL/SQL, by Ivan Bayross, BPB Publications.

QUERIES ??

THANK YOU