Project Work Of Database Management System

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Database and Database Management System

- Database: A **database** is an organized collection of structured data stored electronically. It allows for efficient data storage, retrieval, and management, typically in tables. For examples: MySQL, Oracle, MongoDB

- Database Management System (DBMS): A **DBMS** is software that manages databases, providing tools for defining, querying, updating, and securing data. It acts as an interface between the database and users or applications, ensuring data integrity, security, and efficient access. For examples: SQL Server, PostgreSQL, MongoDB

Constraints

Constraints in a database are rules applied to columns in a table to enforce data integrity, accuracy, and reliability. They ensure that the data entered into the database adheres to certain conditions or rules.

Types of Constraints:

1. **Primary Key Constraint**:
   - Ensures each row in the table is unique and not null.
   - Example: PRIMARY KEY (ID)
2. **Foreign Key Constraint**:
   - Enforces a link between two tables by ensuring the value in a column matches a value in the referenced table.
   - Example: FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID)
3. **Unique Constraint**:
   - Ensures that all values in a column or a set of columns are unique across the table.
   - Example: UNIQUE (Email)
4. **Not Null Constraint**:
   - Ensures that a column cannot contain NULL values.
   - Example: Name VARCHAR(100) NOT NULL
5. **Check Constraint**:
   - Ensures that all values in a column satisfy a specific condition.
   - Example: CHECK (Age >= 18)
6. **Default Constraint**:
   - Assign a column default value if no value is specified during data insertion.
   - Example: Salary DECIMAL(10, 2) DEFAULT 50000

Primary key

A **primary key** is a column or a combination of columns in a database table that uniquely identifies each row in that table. It ensures that no two rows have the same primary key value, maintaining the integrity and uniqueness of the data.

Key Characteristics:

- **Uniqueness**: Each value in the primary key column(s) must be unique.
- **Not Null**: A primary key cannot contain NULL values.
- **Single or Composite**: It can be a single column (e.g., ID) or a combination of columns (composite key, e.g., FirstName + LastName).

Example:

In a Student table:

```
CREATE TABLE Student (
   UserID INT PRIMARY KEY,
   Username VARCHAR(50),
   Email VARCHAR(100)
);
```

Foreign Key

A **foreign key** is a column or a set of columns in a database table that creates a relationship between two tables. It links the data in one table (the child table) to a primary key or unique key in another table (the parent table), enforcing referential integrity.

Key Characteristics:

- **Relationship**: The foreign key establishes a link between the child table and the parent table.
- **Referential Integrity**: Ensures that the values in the foreign key column must match values in the primary key or unique key column of the parent table, or be `NULL`.
- **Cascading Actions**: When a referenced row in the parent table is updated or deleted, the changes can cascade to the child table, depending on the defined rules.

Example:

In an Orders table, where each order is linked to a customer:

```
CREATE TABLE Orders (
   OrderID INT PRIMARY KEY,
   OrderDate DATE,
   CustomerID INT,
   FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID)
);
```

Few Commands of SQL

1. To Create a database:
   - CREATE DATABASE databasename;
   - Example: CREATE DATABASE college;

2. To Delete a database:
   - DROP DATABASE databasename;
   - Example: DROP DATABASE college;

3. To Create a Table:
   - CREATE TABLE table_name(
     column1 datatype,
     column2 datatype,
     colulmn3 datatype,
     ……..
     );
   - Example: CREATE TABLE student(
     Roll_no int primary key,
     Name varchar(50),
     Class int,
     College_name varchar(40)
     );

4. To Delete a Table:
   - DROP TABLE table_name;
   - Example: DROP TABLE student;

5. To Alter Table:
    - The ALTER TABLE statement is used to add, delete or modify columns in an existing table. Also used to add and drop various constraints on an existing table.

    For adding primary key

    ALTER TABEL table_name ADD PRIMARY KEY column_name;

    For adding foreign key

    ALTER TABEL table_name ADD FOREIGN KEY(column_name) REFERENCES table_name(column_name);

    For changing datatype

    ALTER TABEL table_name ALTER COUMN column_name TYPE new_data_type;

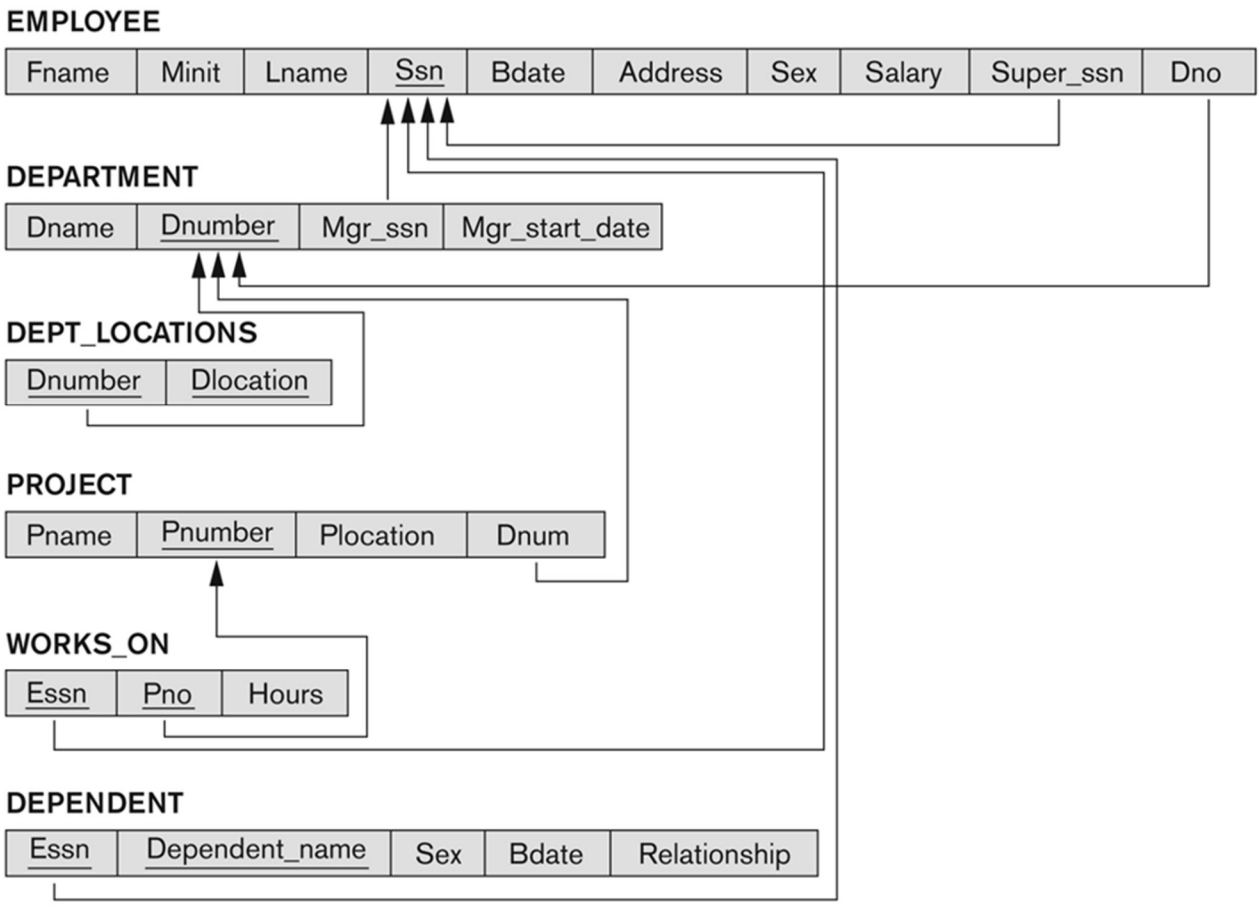
(like this…)

6. To display the schema of table
    - desc table_name;

7. To display the data of table
    - select * from table_name;

QN:

Figure 5.7
Referential integrity constraints displayed on the COMPANY relational database schema.



SQL Code:

DDL Operation:

```
create database arjun_company;
use arjun_company;
create table employee(Fname varchar(30), Minit varchar(40), Lname
varchar(40),Ssn int primary key, Bdate date, Address varchar(60), Sex
varchar(7), Salary decimal(6,2), Super_ssn int, Dno int);

create table department(Dname varchar(30),Dnumber int primary
key,Mgr_ssn int, Mgr_start_date date,
foreign key(mgr_ssn) references employee(ssn) on delete set NULL);

alter table employee add foreign key(Dno) references
department(Dnumber) on delete set NULL;
alter table employee add foreign key(Super_ssn) references
employee(ssn) on delete set NULL;

create table project(Pname varchar(50),Pnumber int primary key,
Plocation varchar(50),Dnum int,
foreign key(Dnum) references department(Dnumber) on delete set NULL);

create table works_on(Essn int, Pno int, Hours decimal(5,2),primary
key(Essn,Pno),
foreign key(Essn) references employee(ssn) on delete cascade,
foreign key(Pno) references project(Pnumber) on delete cascade);

create table dependent(Essn int, dependent_name varchar(50),Sex
varchar(7),Bdate date,Relationship varchar(40),primary
key(Essn,Dependent_name),
foreign key(Essn) references employee(ssn) on delete cascade);

create table dept_locations(Dnumber int,Dlocation varchar(40), primary
key(Dnumber,Dlocation),
foreign key(Dnumber) references department(Dnumber));
```

DML Operation:

Insertion and Update on Employee Table:

```
insert into employee values("Arjun", "Kumar", "Rokka",1, "2005-
01-11", "Anamnagar, ktm", "Male",85000, NULL, NULL);

update employee set Dno=1 where ssn=1;
```

```
update employee set Super_ssn=1 where ssn=1;

insert into employee values("Ashal", "Raj", "Khanal", 2, "2004-
02-23", "Lainchur", "Male", 60500, 1, 2);

insert into employee values("Pabitra", "Maya", "Rimal", 3, "2005-
02-16", "Gorkha", "Female", 56500, 1, 101);
```

Insertion on Department Table:

```
insert into department values("CSIT", 1, 1, "2010-01-22");

insert into department values("Bit", 2, 2, "2010-01-22");

insert into department values("Physics", 101, 3, "2010-01-22");
```

Insertion on Dept_locations Table:

```
insert into dept_locations values(1,"Lainchur,KTM");

insert into dept_locations values(2,"Lainchur,KTM");

insert into dept_locations values(101,"Lainchur,KTM");
```

Insertion on Dependent Table:

```
insert into dept_locations values(1,"Simon Gurung", "Male",
"2004-01-21", "Friend");

insert into dept_locations values(1,"Roshan Luhar", "Male",
"2004-01-20", "Friend");
```

Insertion on Dependent Table:

```
insert into dept_locations values(1,"Simon Gurung", "Male",
"2004-01-21", "Friend");
```

Insertion on Project Table:

```
insert into project values("Machenical Part Assembling", 201,
"Lainchur, KTM", 2);
```

```
insert into project values("Science Experiment", 505, "Lainchur, KTM", 2);

insert into project values("Administration Protol", 1001, "Thamel, KTM", 1);
```

DDL Schema:

```
MariaDB [(none)]> show databases;
+--------------------+
| Database           |
+--------------------+
| arjun              |
| arjun_company      |
| company            |
| csit_arjun         |
| information_schema |
| mysql              |
| performance_schema |
| phpmyadmin         |
| test               |
+--------------------+
9 rows in set (0.001 sec)

MariaDB [(none)]> use arjun_company;
Database changed
```

```
MariaDB [arjun_company]> desc employee;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| Fname     | varchar(30) | YES  |     | NULL    |       |
| Minit     | varchar(40) | YES  |     | NULL    |       |
| Lname     | varchar(40) | YES  |     | NULL    |       |
| Ssn       | int(11)     | NO   | PRI | NULL    |       |
| Bdate     | date        | YES  |     | NULL    |       |
| Address   | varchar(60) | YES  |     | NULL    |       |
| Sex       | varchar(7)  | YES  |     | NULL    |       |
| Salary    | decimal(6,2)| YES  |     | NULL    |       |
| Super_ssn | int(11)     | YES  | MUL | NULL    |       |
| Dno       | int(11)     | YES  | MUL | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
10 rows in set (0.011 sec)

MariaDB [arjun_company]> desc department;
+----------------+-------------+------+-----+---------+-------+
| Field          | Type        | Null | Key | Default | Extra |
+----------------+-------------+------+-----+---------+-------+
| Dname          | varchar(30) | YES  |     | NULL    |       |
| Dnumber        | int(11)     | NO   | PRI | NULL    |       |
| Mgr_ssn        | int(11)     | YES  | MUL | NULL    |       |
| Mgr_start_date | date        | YES  |     | NULL    |       |
+----------------+-------------+------+-----+---------+-------+
4 rows in set (0.010 sec)
```

```
MariaDB [arjun_company]> desc department;
+---------------+-------------+------+-----+---------+-------+
| Field         | Type        | Null | Key | Default | Extra |
+---------------+-------------+------+-----+---------+-------+
| Dname         | varchar(30) | YES  |     | NULL    |       |
| Dnumber       | int(11)     | NO   | PRI | NULL    |       |
| Mgr_ssn       | int(11)     | YES  | MUL | NULL    |       |
| Mgr_start_date | date       | YES  |     | NULL    |       |
+---------------+-------------+------+-----+---------+-------+
4 rows in set (0.010 sec)

MariaDB [arjun_company]> desc dependent;
+---------------+-------------+------+-----+---------+-------+
| Field         | Type        | Null | Key | Default | Extra |
+---------------+-------------+------+-----+---------+-------+
| Essn          | int(11)     | NO   | PRI | NULL    |       |
| Dependent_name | varchar(50) | NO  | PRI | NULL    |       |
| Sex           | varchar(7)  | YES  |     | NULL    |       |
| Bdate         | date        | YES  |     | NULL    |       |
| Relationship  | varchar(40) | YES  |     | NULL    |       |
+---------------+-------------+------+-----+---------+-------+
5 rows in set (0.010 sec)

MariaDB [arjun_company]> desc dept_locations;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| Dnumber  | int(11)     | NO   | PRI | NULL    |       |
| Dlocation | varchar(40) | NO  | PRI | NULL    |       |
+----------+-------------+------+-----+---------+-------+
2 rows in set (0.008 sec)
```

```
MariaDB [arjun_company]> desc dept_locations;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| Dnumber  | int(11)     | NO   | PRI | NULL    |       |
| Dlocation | varchar(40) | NO  | PRI | NULL    |       |
+----------+-------------+------+-----+---------+-------+
2 rows in set (0.008 sec)

MariaDB [arjun_company]> desc project;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| Pname    | varchar(50) | YES  |     | NULL    |       |
| Pnumber  | int(11)     | NO   | PRI | NULL    |       |
| Plocation | varchar(50) | YES |     | NULL    |       |
| Dnum     | int(11)     | YES  | MUL | NULL    |       |
+----------+-------------+------+-----+---------+-------+
4 rows in set (0.014 sec)

MariaDB [arjun_company]> desc works_on;
+-------+--------------+------+-----+---------+-------+
| Field | Type         | Null | Key | Default | Extra |
+-------+--------------+------+-----+---------+-------+
| Essn  | int(11)      | NO   | PRI | NULL    |       |
| Pno   | int(11)      | NO   | PRI | NULL    |       |
| Hours | decimal(5,2) | YES  |     | NULL    |       |
+-------+--------------+------+-----+---------+-------+
3 rows in set (0.013 sec)
```

DML

Employee Table:

```
MariaDB [arjun_company]> select * from employee;
+---------+-------+--------+-----+------------+----------------+--------+----------+-----------+------+
| Fname   | Minit | Lname  | Ssn | Bdate      | Address        | Sex    | Salary   | Super_ssn | Dno  |
+---------+-------+--------+-----+------------+----------------+--------+----------+-----------+------+
| Arjun   | Kumar | Rokka  |   1 | 2005-01-11 | Anamanagar,ktm | Male   | 85000.00 |         1 |    1 |
| Ashal   | Raj   | Khanal |   2 | 2004-02-23 | Lainchur       | Male   | 60500.00 |         1 |    2 |
| Pabitra | Maya  | Rimal  |   3 | 2005-02-16 | Gorkha         | Female | 56500.00 |         1 |  101 |
+---------+-------+--------+-----+------------+----------------+--------+----------+-----------+------+
3 rows in set (0.001 sec)
```

Department:

```
MariaDB [arjun_company]> select * from department;
+---------+---------+---------+-----------------+
| Dname   | Dnumber | Mgr_ssn | Mgr_start_date |
+---------+---------+---------+-----------------+
| CSIT    |       1 |       1 | 2010-01-22      |
| Bit     |       2 |       2 | 2010-01-22      |
| Physics |     101 |       3 | 2015-04-21      |
+---------+---------+---------+-----------------+
3 rows in set (0.001 sec)
```

Dependent:

```
MariaDB [arjun_company]> select * from dependent;
+------+----------------+------+------------+--------------+
| Essn | Dependent_name | Sex  | Bdate      | Relationship |
+------+----------------+------+------------+--------------+
|    1 | Simon Gurung   | Male | 2004-01-21 | Friend       |
|    2 | Roshan Luhar   | Male | 2004-01-20 | Friend       |
+------+----------------+------+------------+--------------+
2 rows in set (0.000 sec)
```

Dept_locations:

```
MariaDB [arjun_company]> select * from dept_locations;
+---------+--------------+
| Dnumber | Dlocation    |
+---------+--------------+
|       1 | Lainchur,KTM |
|       2 | Lainchur,KTM |
|     101 | Lainchur,KTM |
+---------+--------------+
3 rows in set (0.000 sec)
```

Project:

```
MariaDB [arjun_company]> select * from project;
+--------------------------+---------+--------------+------+
| Pname                    | Pnumber | Plocation    | Dnum |
+--------------------------+---------+--------------+------+
| Machenical Part Assembling |     201 | Lainchur,KTM |    2 |
| Science Experiment       |     505 | Lainchur,KTM |  101 |
| Administration Protol    |    1001 | Thamel,KTM   |    1 |
+--------------------------+---------+--------------+------+
3 rows in set (0.000 sec)
```

Works_on:

```
MariaDB [arjun_company]> select * from works_on;
+------+------+-------+
| Essn | Pno  | Hours |
+------+------+-------+
|    1 | 1001 |  8.00 |
|    2 |  201 | 10.00 |
|    3 |  505 |  8.00 |
+------+------+-------+
3 rows in set (0.000 sec)
```