22CS30027
Golla Meghanandh Manvith Prabhash

ASSIGNMENT 1 : REPORT

1. Citizens

- **Attributes**: Citizen_ID, Citizen Name, Gender, Date of Birth, Marital Status, Phone Number, Father's Name, Mother's Name, Income, Spouse's Name, No of Children, Educational Qualification.
- **Role**: Central entity representing individual citizens, capturing personal and demographic details.
- **Relationships**:
    - Pays taxes (Citizen's Tax).
    - Belongs to a family (Family).
    - Can be part of the panchayat (Panchayat Member).

2. Families

- **Attributes**: Family_ID, Address, Total Income, Total Number of Members.
- **Role**: Groups citizens into households, providing aggregate information about their income and size.
- **Relationships**:
    - Linked with citizens as members.
    - Maintains collective information about expenditures and income.

3. Taxation

- **Attributes**: Tax_ID, Tax Slab, Tax Exemptions, Taxable Amount, Due Date.
- **Role**: Tracks taxes paid by citizens, including the taxable amount and applicable exceptions.
- **Relationships**:
    - Paid by citizens.

4. Agriculture Data

- **Attributes**: Agriculture_Land_ID, Number of Acres, Nominee, Cost/Acre, Location of Land, Yield/Crop Type.
- **Role**: Records land ownership details, including the area, location, and productivity.
- **Relationships**:
    - Landowners are linked to citizens.
    - Supports panchayat activities and environmental planning.

5. Panchayat Member

- **Attributes**: Panchayat_Member_ID, Post, Joining Date, Expected Ending Date.

- **Role**: Tracks individuals serving as members of the local governing body (panchayat).
- **Relationships**:
    - Linked to citizens.
    - Contributes to governance and scheme implementation.

6. Welfare Schemes

- **Attributes**: Scheme_ID, Scheme Name, Budget, Details.
- **Role**: Records details of welfare schemes, including eligibility and budget.
- **Relationships**:
    - Applicable to citizens.

7. Expenditure

- **Attributes**: Bill_ID, Amount, Mode of Transaction, Date, Name of Item, Description, Name of Buyer.
- **Role**: Tracks expenditure data for individuals or families.
- **Relationships**:
    - Linked to citizens and families.
    - Maintains accountability for spending.

8. Income

- **Attributes**: Income_ID, Income Type, Income, Description.
- **Role**: Records sources and amounts of income earned by individuals or families.
- **Relationships**:
    - Linked to citizens and families.

9. Certificates

- **Attributes**: Certificate_ID, Type of Certificate, Issued By, Validity Date.
- **Role**: Tracks official certificates issued to citizens.
- **Relationships**:
    - Issued to citizens.
    - Issued by Panchayat Members

10. Asset Management

- **Attributes**: Asset_ID, Type, Description, Amount Spent.
- **Role**: Manages assets like infrastructure and their associated costs.
- **Relationships**:
    - Linked to citizens or families managing these assets.

11. Census Data

- **Attributes**: Census_ID, Year, Population, Birth Rate, Death Rate, Gender Ratio, Migration Rate.

- **Role**: Tracks demographic statistics.
- **Relationships**:
    - Aggregates citizen and family data.

12. Environmental Data

- **Attributes**: Record_ID, Date, Solid Reports, Air Pollution Reports, Tree Plantation Rate, Deforestation Report, Water/Ground Water Reports, Waste Management.
- **Role**: Tracks environmental factors in the region.
- **Relationships**:
    - Reported and conducted by citizens or panchayat members.

ASSIGNMENT 2 : REPORT

1. Households

- **Purpose**: Represents family units or households in the system.
- **Attributes**:
  - household_id: Unique identifier for each household.
  - address: Address of the household.
  - income: Total household income (must be non-negative).
- **Relationships**:
  - Connected to citizens via the household_id foreign key.
  - Linked with census_data to track household-level events.

```sql
-- Table: households
CREATE TABLE households (
    household_id SERIAL PRIMARY KEY,
    address TEXT NOT NULL,
    income DECIMAL(15, 2) NOT NULL CHECK (income >= 0)
);
```

2. Citizens

- **Purpose**: Central entity representing individuals in the system.
- **Attributes**:
  - citizen_id: Unique identifier for each citizen.
  - name, gender, dob: Personal details.
  - household_id: Foreign key referencing the households table.
  - education_status,educational_qualification, occupation: Details about education and profession.
  - father_id, mother_id, spouse_id: Self-referencing foreign keys for relationships.
- **Relationships**:
  - Linked with households, land_records, panchayat_employees, vaccinations, and welfare_schemes.
  - Connected to census_data for tracking events like births, deaths, marriages, or divorces.

```sql
-- Table: citizens
CREATE TABLE citizens (
    citizen_id SERIAL PRIMARY KEY,
    name TEXT NOT NULL,
    gender TEXT CHECK (gender IN ('Male', 'Female', 'Other')),
    dob DATE NOT NULL,
    household_id INT REFERENCES households(household_id) ON DELETE CASCADE,
    education_status TEXT CHECK (education_status IN ('Yes','No')),
    educational_qualification TEXT,
    occupation TEXT,
    father_id INT REFERENCES citizens(citizen_id) ON DELETE SET NULL,
    mother_id INT REFERENCES citizens(citizen_id) ON DELETE SET NULL,
    spouse_id INT REFERENCES citizens(citizen_id) ON DELETE SET NULL
);
```

3. Land Records

- **Purpose**: Tracks land ownership and usage by citizens.
- **Attributes**:
    - land_id: Unique identifier for each land record.
    - citizen_id: Foreign key linking to the citizens table.
    - area_acres: Land area in acres (must be positive).
    - crop_type: Type of crop grown on the land.
- **Relationships**:
    - Linked to citizens as landowners.

```sql
-- Table: land_records
CREATE TABLE land_records (
    land_id SERIAL PRIMARY KEY,
    citizen_id INT REFERENCES citizens(citizen_id) ON DELETE CASCADE,
    area_acres DECIMAL(10, 2) NOT NULL CHECK (area_acres > 0),
    crop_type TEXT
);
```

4. Panchayat Employees

- **Purpose**: Maintains records of employees in the local governing body (panchayat).
- **Attributes**:
    - employee_id: Unique identifier for each employee.
    - citizen_id: Foreign key linking to the citizens table.
    - role: Designation or role in the panchayat.
- **Relationships**:
    - Linked to citizens as employees.

```sql
-- Table: panchayat_employees
CREATE TABLE panchayat_employees (
    employee_id SERIAL PRIMARY KEY,
    citizen_id INT REFERENCES citizens(citizen_id) ON DELETE CASCADE,
    role TEXT NOT NULL
);
```

5. Assets

- **Purpose**: Represents physical or infrastructural assets managed by the panchayat.
- **Attributes**:
    - asset_id: Unique identifier for each asset.
    - type: Type of asset (e.g., Street Light, Building).
    - location: Physical location of the asset.
    - installation_date: Date of installation.
- **Relationships**:
    - Uniquely managed as standalone records.

```sql
-- Table: assets
CREATE TABLE assets (
    asset_id SERIAL PRIMARY KEY,
    type TEXT NOT NULL,
    location TEXT NOT NULL,
    installation_date DATE NOT NULL
);
```

6. Welfare Schemes

- **Purpose**: Stores details of welfare schemes available to citizens.
- **Attributes**:
    - scheme_id: Unique identifier for each scheme.
    - name: Name of the welfare scheme.
    - description: Brief details about the scheme.
- **Relationships**:
    - Linked with citizens through the scheme_enrollments table.

```
-- Table: welfare_schemes
CREATE TABLE welfare_schemes (
    scheme_id SERIAL PRIMARY KEY,
    name TEXT NOT NULL,
    description TEXT
);
```

7. Scheme Enrollments

- **Purpose**: Tracks citizen participation in welfare schemes.
- **Attributes**:
    - enrollment_id: Unique identifier for each enrollment.
    - citizen_id: Foreign key linking to the citizens table.
    - scheme_id: Foreign key linking to the welfare_schemes table.
    - enrollment_date: Date of enrollment.
- **Relationships**:
    - Connects citizens and welfare_schemes.

```
-- Table: scheme_enrollments
CREATE TABLE scheme_enrollments (
    enrollment_id SERIAL PRIMARY KEY,
    citizen_id INT REFERENCES citizens(citizen_id) ON DELETE CASCADE,
    scheme_id INT REFERENCES welfare_schemes(scheme_id) ON DELETE CASCADE,
    enrollment_date DATE NOT NULL
);
```

8. Vaccinations

- **Purpose**: Tracks vaccination records of citizens.
- **Attributes**:
    - vaccination_id: Unique identifier for each vaccination record.
    - citizen_id: Foreign key linking to the citizens table.
    - vaccine_type: Type of vaccine administered.
    - date_administered: Date of vaccination.
- **Relationships**:
    - Linked to citizens for vaccination tracking.

```
-- Table: vaccinations
CREATE TABLE vaccinations (
    vaccination_id SERIAL PRIMARY KEY,
    citizen_id INT REFERENCES citizens(citizen_id) ON DELETE CASCADE,
    vaccine_type TEXT NOT NULL,
    date_administered DATE NOT NULL
);
```

9. Census Data

- **Purpose**: Logs demographic events for citizens and households.
- **Attributes**:
    - household_id, citizen_id: Foreign keys referencing households and citizens.
    - event_type: Type of event (Birth, Death, Marriage, Divorce).
    - event_date: Date of the event.
- **Relationships**:
    - Links households and citizens to demographic events.

```sql
-- Table: census_data
CREATE TABLE census_data (
    household_id INT REFERENCES households(household_id) ON DELETE CASCADE,
    citizen_id INT REFERENCES citizens(citizen_id) ON DELETE CASCADE,
    event_type TEXT NOT NULL CHECK (event_type IN ('Birth', 'Death', 'Marriage', 'Divorce')),
    event_date DATE NOT NULL,
    PRIMARY KEY (household_id, citizen_id, event_type, event_date)
);
```

ON DELETE CASCADE : Automatically deletes dependent records, maintaining integrity.
ON DELETE SET NULL : Preserves relationships by setting references to NULL when parent records are deleted.
REFERENCES : Foreign key constraints ensure data consistency across related tables.
VALIDATION CONSTRAINTS: CHECK constraints ensure valid data (e.g., income >= 0, valid gender, positive area_acres).

SOLUTIONS :

A. Show names of all citizens who holds more than 1 acre of land.

```
22CS30027=> -- A Question
SELECT a.name
FROM citizens a
JOIN land_records r ON a.citizen_id = r.citizen_id
GROUP BY a.name
HAVING SUM(r.area_acres) > 1
;
     name
--------------
 G Sridhar
 S Satti Babu
 G Venu
(3 rows)
```

B. Show name of all girls who study in school with household income less than 1 Lakh per year.

```
22CS30027=> -- B Question
SELECT b.name
FROM citizens b
JOIN households h ON b.household_id = h.household_id
WHERE b.gender = 'Female'
AND h.income < 100000
AND b.education_status = 'Yes'
AND DATE_PART('year', AGE(b.dob)) BETWEEN 5 and 18
;
    name
------------
 G Meenakshi
(1 row)
```

C. How many acres of land cultivate rice.

```
22CS30027=> -- C Question
SELECT SUM(area_acres) AS total_land_area_inacres
FROM land_records l
WHERE l.crop_type = 'rice'
;
 total_land_area_inacres
-------------------------
                    3.30
(1 row)
```

D. Number of citizens who are born after 1.1.2000 and have educational qualification of 10th class.

```
22CS30027=> -- D Question
SELECT COUNT(citizen_id) AS total_citizens
FROM citizens
WHERE dob > '2000-01-01'
AND educational_qualification = '10th'
;
 total_citizens
----------------
              2
(1 row)
```

E. Name of all employees of panchayat who also hold more than 1 acre land.

```
22CS30027=> -- E Question
SELECT e.name
FROM panchayat_employees p
JOIN citizens e ON p.citizen_id = e.citizen_id
JOIN land_records l ON l.citizen_id = e.citizen_id
GROUP BY e.name
HAVING SUM(l.area_acres) > 1
;
     name
--------------
 G Sridhar
 S Satti Babu
 G Venu
(3 rows)
```

F. Name of the household members of Panchayat Pradhan.

```
22CS30027=> -- F Question
SELECT c2.name
FROM citizens c1
JOIN panchayat_employees pe ON c1.citizen_id = pe.citizen_id
JOIN citizens c2 ON c1.household_id = c2.household_id
WHERE pe.role = 'Panchayat Pradhan'
;
      name
----------------
 G Adhi Lakshmi
 G M M Prabahsh
 G Meenakshi
 G Sridhar
(4 rows)
```

G. Total number of street light assets installed in a particular locality named Phulera that are installed in 2024.

```
22CS30027=> -- G Question
SELECT COUNT(*) AS total_street_lights
FROM assets
WHERE type = 'Street Light'
AND location = 'Phulera'
AND EXTRACT(YEAR FROM installation_date) = 2024
;
 total_street_lights
---------------------
                   1
(1 row)
```

H. Number of vaccinations done in 2024 for the children of citizens whose educational qualification is class 10.

```
22CS30027=> -- H Question
SELECT COUNT(v.vaccination_id) AS num_vaccinations
FROM citizens c
JOIN citizens children ON c.citizen_id = children.father_id OR c.citizen_id = children.mother_id
JOIN vaccinations v ON children.citizen_id = v.citizen_id
WHERE c.educational_qualification = '10th'
AND EXTRACT(YEAR FROM v.date_administered) = 2024
AND DATE_PART('year', AGE(children.dob)) <= 18
;
 num_vaccinations
------------------
                2
(1 row)
```

I. Total number of births of boy child in the year 2024.

```
22CS30027=> -- I Question
SELECT COUNT(*) AS total_births
FROM census_data cd
JOIN citizens c ON cd.citizen_id = c.citizen_id
WHERE cd.event_type = 'Birth'
AND EXTRACT(YEAR FROM cd.event_date) = 2024
AND c.gender = 'Male'
;
 total_births
--------------
            0
(1 row)
```

J. Number of citizens who belong to the household of at least one panchayat employee.

```
22CS30027=> --J Question
SELECT COUNT(DISTINCT c.citizen_id) AS total_citizens
FROM citizens c
WHERE c.household_id IN (
    SELECT DISTINCT h.household_id
    FROM households h
    JOIN panchayat_employees pe ON h.household_id = (SELECT household_id FROM citizens WHERE citizen_id = pe.citizen_id)
)
;
 total_citizens
----------------
             16
(1 row)
```