

DBMS Lab Assignment 3: Database Connectivity

Chandransh Singh

22CS30017

1) SQL program

```
-- Drop table if exists
DROP TABLE IF EXISTS household, citizen, land_record, panchayat_employee, asset, welfare_scheme,
scheme_enrollment, vaccination, census_data;

CREATE TABLE household (
    household_id INT PRIMARY KEY,
    address TEXT NOT NULL,
    income DECIMAL(10, 2) NOT NULL
);

CREATE TABLE citizen (
    citizen_ID INT PRIMARY KEY,
    name VARCHAR(100) NOT NULL,
    gender CHAR(1) NOT NULL,
    date_of_birth DATE NOT NULL,
    household_id INT,
    education_qualification VARCHAR(50),
    FOREIGN KEY (household_id) REFERENCES household(household_id)
);

CREATE TABLE land_record (
    land_id INT PRIMARY KEY,
    citizen_id INT,
    area_acres DECIMAL(10, 2) NOT NULL,
    crop_type TEXT NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);

CREATE TABLE panchayat_employee (
    employee_id INT PRIMARY KEY,
    citizen_id INT,
    role TEXT NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);

CREATE TABLE asset (
    asset_id INT PRIMARY KEY,
    type TEXT NOT NULL,
    location TEXT NOT NULL,
    installation_date DATE NOT NULL
);

CREATE TABLE welfare_scheme (
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    scheme_id INT PRIMARY KEY,
    name TEXT NOT NULL,
    description TEXT
);

CREATE TABLE scheme_enrollment (
    enrollment_id INT PRIMARY KEY,
    citizen_id INT,
    scheme_id INT,
    enrollment_date DATE NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id),
    FOREIGN KEY (scheme_id) REFERENCES welfare_scheme(scheme_id)
);

CREATE TABLE vaccination (
    vaccination_id INT PRIMARY KEY,
    citizen_id INT,
    vaccine_type TEXT NOT NULL,
    date_administered DATE NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);

CREATE TABLE census_data (
    household_id INT,
    citizen_id INT,
    event_type TEXT NOT NULL,
    event_date DATE NOT NULL,
    FOREIGN KEY (household_id) REFERENCES household(household_id),
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);

-- inserting data

-- household
INSERT INTO household (household_id, address, income) VALUES
(1, '123, MG Road, Mumbai', 95000.00),
(2, '456, Park Street, Kolkata', 125000.00),
(3, '789, Brigade Road, Bangalore', 75000.00),
(4, '101, Anna Salai, Chennai', 145000.00),
(5, '202, Connaught Place, Delhi', 82000.00),
(6, '303, Banjara Hills, Hyderabad', 102500.00),
(7, '404, Marine Drive, Kochi', 98000.00),
(8, '505, Law Garden, Ahmedabad', 110000.00),
(9, '606, Civil Lines, Jaipur', 87000.00),
(10, '707, Rajwada, Indore', 130000.00);

-- citizen
INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification) VALUES
(1, 'Amit Sharma', 'M', '1990-05-12', 1, 'Graduate'),

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(2, 'Priya Singh', 'F', '2005-09-15', 2, '10th'),
(3, 'Anjali Gupta', 'F', '2010-11-25', 3, 'Primary'),
(4, 'Rohit Verma', 'M', '1998-01-20', 4, '12th'),
(5, 'Sneha Patel', 'F', '2012-03-05', 5, 'Primary'),
(6, 'Vikram Rao', 'M', '1985-07-19', 6, 'Post-Graduate'),
(7, 'Pooja Mehta', 'F', '2008-08-17', 10, '12th'),
(8, 'Arjun Nair', 'M', '2000-12-30', 8, 'Secondary'),
(9, 'Kavya Iyer', 'F', '2003-04-14', 9, 'Graduate'),
(10, 'Rohan Desai', 'M', '2015-06-10', 10, 'Primary'),
(11, 'Neha Singh', 'F', '1995-02-28', 1, 'Post-Graduate'),
(12, 'Rajesh Kumar', 'M', '1980-10-05', 2, 'Graduate'),
(13, 'Sunita Devi', 'F', '1975-12-15', 3, 'Secondary'),
(14, 'Rahul Kumar', 'M', '2002-05-12', 1, '10th'),
(15, 'Meena Sharma', 'F', '1965-06-05', 5, 'Graduate'),
(16, 'Ramesh Patel', 'M', '1960-07-19', 6, 'Secondary'),
(17, 'Geeta Rao', 'F', '1955-08-17', 7, 'Post-Graduate'),
(18, 'Rajesh Nair', 'M', '1950-12-30', 8, 'Graduate'),
(19, 'Kamini Iyer', 'F', '1945-04-14', 9, 'Secondary'),
(20, 'Raj Desai', 'M', '1940-06-10', 10, 'Post-Graduate'),
(21, 'Vijay Singh', 'M', '1970-04-20', 4, 'Post-Graduate'),
(22, 'Sita Devi', 'F', '2004-09-15', 2, '10th'),
(23, 'Mohan Das', 'M', '2001-11-25', 3, '10th'),
(24, 'Gita Verma', 'F', '1999-01-20', 4, '12th'),
(25, 'Raj Patel', 'M', '2013-03-05', 1, 'Primary'),
(26, 'Meena Rao', 'F', '1986-07-19', 6, 'Post-Graduate'),
(27, 'Ramesh Mehta', 'M', '2009-08-17', 7, '10th'),
(28, 'Geeta Nair', 'F', '2002-12-30', 8, 'Secondary'),
(29, 'Rajesh Iyer', 'M', '2005-04-14', 9, 'Graduate'),
(30, 'Kamal Desai', 'M', '2016-06-10', 10, 'Primary'),
(31, 'eheh', 'M', '2024-04-04', 3, 'Primary');

-- land_record
INSERT INTO land_record (land_id, citizen_id, area_acres, crop_type) VALUES
(1, 1, 1.5, 'Rice'),
(2, 2, 0.8, 'Wheat'),
(3, 3, 2.0, 'Cotton'),
(4, 4, 0.5, 'Rice'),
(5, 5, 1.2, 'Maize'),
(6, 6, 1.8, 'Rice'),
(7, 7, 0.6, 'Wheat'),
(8, 8, 2.5, 'Sugarcane'),
(9, 9, 1.0, 'Rice'),
(10, 10, 0.9, 'Cotton');

-- panchayat_employee
INSERT INTO panchayat_employee (employee_id, citizen_id, role) VALUES
(1, 1, 'Panchayat Pradhan'),
(2, 2, 'Secretary'),
(3, 6, 'Member'),
(4, 8, 'Treasurer'),

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(5, 10, 'Member'),
(6, 11, 'Vice President'),
(7, 12, 'Member'),
(8, 16, 'Secretary'),
(9, 18, 'Auditor'),
(10, 20, 'Treasurer'),
(11, 21, 'Clerk'),
(12, 22, 'Supervisor'),
(13, 23, 'Assistant'),
(14, 24, 'Coordinator'),
(15, 25, 'Advisor');

-- asset
INSERT INTO asset (asset_id, type, location, installation_date) VALUES
(1, 'Street Light', 'Phulera', '2024-01-15'),
(2, 'Street Light', 'Phulera', '2024-02-20'),
(3, 'Water Pump', 'XYZ Village', '2023-08-10'),
(4, 'Road', 'ABC Village', '2022-09-05'),
(5, 'Street Light', 'Phulera', '2024-03-18'),
(6, 'Water Pump', 'XYZ Village', '2023-10-25'),
(7, 'Road', 'ABC Village', '2022-11-30'),
(8, 'Street Light', 'Phulera', '2024-04-15'),
(9, 'Water Pump', 'XYZ Village', '2023-12-20'),
(10, 'Road', 'ABC Village', '2023-01-25'),
(11, 'Street Light', 'XYZ Village', '2024-05-10'),
(12, 'Street Light', 'ABC Village', '2024-06-15'),
(13, 'Street Light', 'LMN Village', '2024-07-20'),
(14, 'Street Light', 'PQR Village', '2024-08-25'),
(15, 'Street Light', 'DEF Village', '2024-09-30');

-- welfare_scheme
INSERT INTO welfare_scheme (scheme_id, name, description) VALUES
(1, 'MNREGA', 'Employment Guarantee Scheme'),
(2, 'PMAY', 'Affordable Housing Scheme'),
(3, 'Midday Meal', 'School Lunch Program'),
(4, 'PMKSY', 'Irrigation Scheme'),
(5, 'PMFBY', 'Crop Insurance Scheme');

-- scheme_enrollments
INSERT INTO scheme_enrollment (enrollment_id, citizen_id, scheme_id, enrollment_date) VALUES
(1, 2, 1, '2023-07-10'),
(2, 3, 2, '2024-01-15'),
(3, 4, 3, '2024-02-01'),
(4, 5, 1, '2024-03-20'),
(5, 6, 2, '2024-04-05'),
(6, 7, 3, '2024-05-10'),
(7, 8, 1, '2024-06-15'),
(8, 9, 2, '2024-07-20'),
(9, 10, 3, '2024-08-25');
```

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-- vaccinations
INSERT INTO vaccination (vaccination_id, citizen_id, vaccine_type, date_administered) VALUES
(1, 5, 'Covid-19', '2024-05-20'),
(2, 7, 'Polio', '2024-03-10'),
(3, 10, 'Hepatitis', '2024-06-15'),
(4, 1, 'Covid-19', '2024-07-20'),
(5, 3, 'Polio', '2024-08-10'),
(6, 31, 'Polio', '2024-06-06');

-- add child birth events in citizen data for year 2024
INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification)
SELECT
    (SELECT MAX(citizen_id) FROM citizen) + ROW_NUMBER() OVER (ORDER BY h.household_id),
    'Child ' || ROW_NUMBER() OVER (ORDER BY h.household_id),
    CASE WHEN RANDOM() < 0.5 THEN 'M' ELSE 'F' END,
    DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365),
    h.household_id,
    'Primary'
FROM household h
WHERE h.household_id IN (SELECT household_id FROM household);

-- census_data
-- add all the birth records from citizen data to census data
INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
SELECT household_id, citizen_id, 'Birth', date_of_birth
    FROM citizen
    WHERE date_of_birth IS NOT NULL;

-- query to add death event in census data who is not an employee and is born before 1980
INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
SELECT household_id, citizen_id, 'Death',
    DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365)
FROM citizen
WHERE citizen_id NOT IN (SELECT citizen_id FROM panchayat_employee)
    AND date_of_birth < '1980-01-01';

-- query to add marriage event in census data for all citizens who are born before 2000
INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
SELECT household_id, citizen_id, 'Marriage',
    DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 9131)
FROM citizen
WHERE date_of_birth < '2000-01-01';

-- query to add divorce event in census data for all citizens who are born between 1990 and 2000
INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
    SELECT household_id, citizen_id, 'Divorce',

```

```

        DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 1826)
FROM citizen
WHERE date_of_birth >= '1990-01-01'
      AND date_of_birth <= '2000-12-31';

-- queries
-- Show names of all citizens who holds more than 1 acre of land
SELECT c.name
      FROM citizen c
      JOIN land_record l
        ON c.citizen_id = l.citizen_id
WHERE l.area_acres > 1;

-- Show name of all girls who study in school with household income less than 1 Lakh per year
SELECT c.name
      FROM household h
      JOIN citizen c
        ON c.household_id = h.household_id
WHERE h.income < 100000.00
      AND c.gender = 'F'
      AND c.education_qualification in ('Primary', 'Secondary', '10th', '12th');

-- How many acres of land cultivate rice
SELECT sum(area_acres) as total_acres
      FROM land_record
WHERE crop_type = 'Rice';

-- Number of citizens who are born after 1.1.2000 and have educational qualification of 10th class
SELECT count(citizen_id) as count
      FROM citizen
WHERE date_of_birth > '2000-01-01'
      AND education_qualification = '10th';

-- Name of all employees of panchayat who also hold more than 1 acre land
SELECT c.name
      FROM citizen c
      JOIN panchayat_employee pe
        ON c.citizen_id = pe.citizen_id
      JOIN land_record l
        ON c.citizen_id = l.citizen_id
WHERE l.area_acres > 1;

-- Name of the household members of Panchayat Pradhan
SELECT c.name
      FROM citizen c
WHERE c.household_id = (
      SELECT ci.household_id
      FROM citizen ci
      JOIN panchayat_employee pe

```

```

        ON ci.citizen_id = pe.citizen_id
    WHERE pe.role = 'Panchayat Pradhan'
);

-- Total number of street light assets installed in a particular locality named Phulera that are
installed in 2024
SELECT count(asset_id) as count
    FROM asset
    WHERE location = 'Phulera'
        AND installation_date >= '2024-01-01'
        AND installation_date <= '2024-12-31'
        AND type = 'Street Light';

-- Number of vaccinations done in 2024 for the children of citizens whose educational qualification
is class 10
SELECT count(DISTINCT c.citizen_id) as count
    FROM citizen c
        -- Join household to get household details of the citizen
        JOIN household h ON c.household_id = h.household_id
        -- Join citizen again to get other members of the same household
        JOIN citizen c2 ON h.household_id = c2.household_id
        -- Join vaccination to get vaccination details of household members
        JOIN vaccination v ON c2.citizen_id = v.citizen_id
    WHERE c.education_qualification = '10th' -- Filter citizens with education qualification of
class 10
        AND v.date_administered >= '2024-01-01' -- Filter vaccinations administered in 2024
        AND v.date_administered <= '2024-12-31'
        AND c2.date_of_birth > c.date_of_birth -- Filter children of the citizens
        AND EXTRACT(YEAR FROM AGE(c2.date_of_birth)) < 18; -- Check if child's age is less than 18

-- Total number of births of boy child in the year 2024
SELECT count(event_type) as count
    FROM census_data
    WHERE event_type = 'Birth'
        AND event_date >= '2024-01-01'
        AND event_date <= '2024-12-31';

-- Number of citizens who belong to the household of at least one panchayat employee
SELECT count(citizen_id) as count
    FROM citizen
    WHERE household_id IN
        (
            SELECT household_id
                FROM citizen
            WHERE citizen_id IN
                (
                    SELECT citizen_id
                        FROM panchayat_employee
                )
        )
);

```

2) High level language programs

a) C++

```
#include <iostream>
#include <string>
#include <vector>
#include <sql.h>
#include <sqlext.h>

// Error handling class
class SQLError {
public:
    static void extract_error(const char* fn, SQLHANDLE handle, SQLSMALLINT type) {
        SQLSMALLINT i = 0;
        SQLINTEGER native;
        SQLCHAR state[7];
        SQLCHAR text[256];
        SQLSMALLINT len;
        SQLRETURN ret;

        std::cout << "\nThe driver reported the following diagnostics whilst running " << fn <<
"\n";

        do {
            ret = SQLGetDiagRec(type, handle, ++i, state, &native, text, sizeof(text), &len);
            if (SQL_SUCCEEDED(ret)) {
                std::cout << state << ":" << i << ":" << native << ":" << text << "\n";
            }
        } while (ret == SQL_SUCCESS);
    }
};

// Database handler class
class DatabaseHandler {
private:
    SQLHENV env;
    SQLHDBC dbc;
    SQLHSTMT stmt;

public:
    DatabaseHandler() : env(nullptr), dbc(nullptr), stmt(nullptr) {}

    bool initialize() {
        SQLRETURN ret;

        ret = SQLAllocHandle(SQL_HANDLE_ENV, SQL_NULL_HANDLE, &env);
        if (!SQL_SUCCEEDED(ret)) return false;

        ret = SQLSetEnvAttr(env, SQL_ATTR_ODBC_VERSION, (void*)SQL_OV_ODBC3, 0);
        if (!SQL_SUCCEEDED(ret)) return false;

        ret = SQLAllocHandle(SQL_HANDLE_DBC, env, &dbc);
```



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        if (!SQL_SUCCEEDED(ret)) return false;

        return true;
    }

    bool connect(const std::string& connStr) {
        SQLCHAR outStr[1024];
        SQLSMALLINT outStrLen;

        SQLRETURN ret = SQLDriverConnect(dbc, NULL,
            (SQLCHAR*)connStr.c_str(), SQL_NTS,
            outStr, sizeof(outStr), &outStrLen,
            SQL_DRIVER_NOPROMPT);

        if (!SQL_SUCCEEDED(ret)) {
            SQLError::extract_error("SQLDriverConnect", dbc, SQL_HANDLE_DBC);
            return false;
        }

        ret = SQLAllocHandle(SQL_HANDLE_STMT, dbc, &stmt);
        return SQL_SUCCEEDED(ret);
    }

    bool execute_query(const std::string& query) {
        SQLRETURN ret = SQLExecDirect(stmt, (SQLCHAR*)query.c_str(), SQL_NTS);
        if (!SQL_SUCCEEDED(ret)) {
            SQLError::extract_error("SQLExecDirect", stmt, SQL_HANDLE_STMT);
            return false;
        }
        SQLCloseCursor(stmt);
        return true;
    }

    void setup_database() {
        std::vector<std::string> create_tables = {
            "DROP TABLE IF EXISTS household, citizen, land_record, panchayat_employee, asset,
welfare_scheme, scheme_enrollment, vaccination, census_data;",

            "CREATE TABLE household (household_id INT PRIMARY KEY, address TEXT NOT NULL, income
DECIMAL(10, 2) NOT NULL);",

            "CREATE TABLE citizen (citizen_id INT PRIMARY KEY, name VARCHAR(100) NOT NULL, gender
CHAR(1) NOT NULL, date_of_birth DATE NOT NULL, household_id INT, education_qualification
VARCHAR(50), FOREIGN KEY (household_id) REFERENCES household(household_id));",

            "CREATE TABLE land_record (land_id INT PRIMARY KEY, citizen_id INT, area_acres
DECIMAL(10, 2) NOT NULL, crop_type TEXT NOT NULL, FOREIGN KEY (citizen_id) REFERENCES
citizen(citizen_id));",

```

```

        "CREATE TABLE panchayat_employee (employee_id INT PRIMARY KEY, citizen_id INT, role TEXT NOT NULL, FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id));",

        "CREATE TABLE asset (asset_id INT PRIMARY KEY, type TEXT NOT NULL, location TEXT NOT NULL, installation_date DATE NOT NULL);",

        "CREATE TABLE welfare_scheme (scheme_id INT PRIMARY KEY, name TEXT NOT NULL, description TEXT);",

        "CREATE TABLE scheme_enrollment (enrollment_id INT PRIMARY KEY, citizen_id INT, scheme_id INT, enrollment_date DATE NOT NULL, FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id), FOREIGN KEY (scheme_id) REFERENCES welfare_scheme(scheme_id));",

        "CREATE TABLE vaccination (vaccination_id INT PRIMARY KEY, citizen_id INT, vaccine_type TEXT NOT NULL, date_administered DATE NOT NULL, FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id));",

        "CREATE TABLE census_data (household_id INT, citizen_id INT, event_type TEXT NOT NULL, event_date DATE NOT NULL, FOREIGN KEY (household_id) REFERENCES household(household_id), FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id));"
    };

    std::vector<std::string> insert_data = {
        // Insert household data
        "INSERT INTO household (household_id, address, income) VALUES "
        "(1, '123, MG Road, Mumbai', 95000.00),"
        "(2, '456, Park Street, Kolkata', 125000.00),"
        "(3, '789, Brigade Road, Bangalore', 75000.00),"
        "(4, '101, Anna Salai, Chennai', 145000.00),"
        "(5, '202, Connaught Place, Delhi', 82000.00),"
        "(6, '303, Banjara Hills, Hyderabad', 102500.00),"
        "(7, '404, Marine Drive, Kochi', 98000.00),"
        "(8, '505, Law Garden, Ahmedabad', 110000.00),"
        "(9, '606, Civil Lines, Jaipur', 87000.00),"
        "(10, '707, Rajwada, Indore', 130000.00);",

        // Insert citizen data
        "INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id, education_qualification) VALUES "
        "(1, 'Amit Sharma', 'M', '1990-05-12', 1, 'Graduate'),"
        "(2, 'Priya Singh', 'F', '2005-09-15', 2, '10th'),"
        "(3, 'Anjali Gupta', 'F', '2010-11-25', 3, 'Primary'),"
        "(4, 'Rohit Verma', 'M', '1998-01-20', 4, '12th'),"
        "(5, 'Sneha Patel', 'F', '2012-03-05', 5, 'Primary'),"
        "(6, 'Vikram Rao', 'M', '1985-07-19', 6, 'Post-Graduate'),"
        "(7, 'Pooja Mehta', 'F', '2008-08-17', 10, '12th'),"
        "(8, 'Arjun Nair', 'M', '2000-12-30', 8, 'Secondary'),"
        "(9, 'Kavya Iyer', 'F', '2003-04-14', 9, 'Graduate'),"
        "(10, 'Rohan Desai', 'M', '2015-06-10', 10, 'Primary'),"
        "(11, 'Neha Singh', 'F', '1995-02-28', 1, 'Post-Graduate'),"
        "(12, 'Rajesh Kumar', 'M', '1980-10-05', 2, 'Graduate'),"
    };

```

```

"(13, 'Sunita Devi', 'F', '1975-12-15', 3, 'Secondary'),"
"(14, 'Rahul Kumar', 'M', '2002-05-12', 1, '10th'),"
"(15, 'Meena Sharma', 'F', '1965-06-05', 5, 'Graduate'),"
"(16, 'Ramesh Patel', 'M', '1960-07-19', 6, 'Secondary'),"
"(17, 'Geeta Rao', 'F', '1955-08-17', 7, 'Post-Graduate'),"
"(18, 'Rajesh Nair', 'M', '1950-12-30', 8, 'Graduate'),"
"(19, 'Kamini Iyer', 'F', '1945-04-14', 9, 'Secondary'),"
"(20, 'Raj Desai', 'M', '1940-06-10', 10, 'Post-Graduate'),"
"(21, 'Vijay Singh', 'M', '1970-04-20', 4, 'Post-Graduate'),"
"(22, 'Sita Devi', 'F', '2004-09-15', 2, '10th'),"
"(23, 'Mohan Das', 'M', '2001-11-25', 3, '10th'),"
"(24, 'Gita Verma', 'F', '1999-01-20', 4, '12th'),"
"(25, 'Raj Patel', 'M', '2013-03-05', 1, 'Primary'),"
"(26, 'Meena Rao', 'F', '1986-07-19', 6, 'Post-Graduate'),"
"(27, 'Ramesh Mehta', 'M', '2009-08-17', 7, '10th'),"
"(28, 'Geeta Nair', 'F', '2002-12-30', 8, 'Secondary'),"
"(29, 'Rajesh Iyer', 'M', '2005-04-14', 9, 'Graduate'),"
"(30, 'Kamal Desai', 'M', '2016-06-10', 10, 'Primary'),"
"(31, 'eheh', 'M', '2024-04-04', 3, 'Primary');"

// Insert land record data
"INSERT INTO land_record (land_id, citizen_id, area_acres, crop_type) VALUES "
"(1, 1, 1.5, 'Rice'),"
"(2, 2, 0.8, 'Wheat'),"
"(3, 3, 2.0, 'Cotton'),"
"(4, 4, 0.5, 'Rice'),"
"(5, 5, 1.2, 'Maize'),"
"(6, 6, 1.8, 'Rice'),"
"(7, 7, 0.6, 'Wheat'),"
"(8, 8, 2.5, 'Sugarcane'),"
"(9, 9, 1.0, 'Rice'),"
"(10, 10, 0.9, 'Cotton');"

// Insert panchayat employee data
"INSERT INTO panchayat_employee (employee_id, citizen_id, role) VALUES "
"(1, 1, 'Panchayat Pradhan'),"
"(2, 2, 'Secretary'),"
"(3, 6, 'Member'),"
"(4, 8, 'Treasurer'),"
"(5, 10, 'Member'),"
"(6, 11, 'Vice President'),"
"(7, 12, 'Member'),"
"(8, 16, 'Secretary'),"
"(9, 18, 'Auditor'),"
"(10, 20, 'Treasurer'),"
"(11, 21, 'Clerk'),"
"(12, 22, 'Supervisor'),"
"(13, 23, 'Assistant'),"
"(14, 24, 'Coordinator'),"
"(15, 25, 'Advisor');"

```

```

// Insert asset data
"INSERT INTO asset (asset_id, type, location, installation_date) VALUES "
"(1, 'Street Light', 'Phulera', '2024-01-15'),"
"(2, 'Street Light', 'Phulera', '2024-02-20'),"
"(3, 'Water Pump', 'XYZ Village', '2023-08-10'),"
"(4, 'Road', 'ABC Village', '2022-09-05'),"
"(5, 'Street Light', 'Phulera', '2024-03-18'),"
"(6, 'Water Pump', 'XYZ Village', '2023-10-25'),"
"(7, 'Road', 'ABC Village', '2022-11-30'),"
"(8, 'Street Light', 'Phulera', '2024-04-15'),"
"(9, 'Water Pump', 'XYZ Village', '2023-12-20'),"
"(10, 'Road', 'ABC Village', '2023-01-25');",

// Insert welfare scheme data
"INSERT INTO welfare_scheme (scheme_id, name, description) VALUES "
"(1, 'MNREGA', 'Employment Guarantee Scheme'),"
"(2, 'PMAY', 'Affordable Housing Scheme'),"
"(3, 'Midday Meal', 'School Lunch Program'),"
"(4, 'PMKSY', 'Irrigation Scheme'),"
"(5, 'PMFBY', 'Crop Insurance Scheme');",

// Insert scheme enrollment data
"INSERT INTO scheme_enrollment (enrollment_id, citizen_id, scheme_id,
enrollment_date) VALUES "
"(1, 2, 1, '2023-07-10'),"
"(2, 3, 2, '2024-01-15'),"
"(3, 4, 3, '2024-02-01'),"
"(4, 5, 1, '2024-03-20'),"
"(5, 6, 2, '2024-04-05'),"
"(6, 7, 3, '2024-05-10'),"
"(7, 8, 1, '2024-06-15'),"
"(8, 9, 2, '2024-07-20'),"
"(9, 10, 3, '2024-08-25');",

// Insert vaccination data
"INSERT INTO vaccination (vaccination_id, citizen_id, vaccine_type,
date_administered) VALUES "
"(1, 5, 'Covid-19', '2024-05-20'),"
"(2, 7, 'Polio', '2024-03-10'),"
"(3, 10, 'Hepatitis', '2024-06-15'),"
"(4, 1, 'Covid-19', '2024-07-20'),"
"(5, 3, 'Polio', '2024-08-10'),"
"(6, 31, 'Polio', '2024-06-06');",

// Insert child birth data for all households
"INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification) "
"SELECT "
"      (SELECT MAX(citizen_id) FROM citizen) + ROW_NUMBER() OVER (ORDER BY
h.household_id), "
"      'Child ' || ROW_NUMBER() OVER (ORDER BY h.household_id), "

```

```

"    CASE WHEN RANDOM() < 0.5 THEN 'M' ELSE 'F' END, "
"    DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365), "
"    h.household_id, "
"    'Primary' "
"FROM household h "
"WHERE h.household_id IN (SELECT household_id FROM household);",

// Census data queries
"INSERT INTO census_data (household_id, citizen_id, event_type, event_date) "
"SELECT household_id, citizen_id, 'Birth', date_of_birth "
"FROM citizen "
"WHERE date_of_birth IS NOT NULL;",

// death
"INSERT INTO census_data (household_id, citizen_id, event_type, event_date) "
"SELECT household_id, citizen_id, 'Death', "
"DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365) "
"FROM citizen "
"WHERE citizen_id NOT IN (SELECT citizen_id FROM panchayat_employee) "
"AND date_of_birth < '1980-01-01';",

// marriage
"INSERT INTO census_data (household_id, citizen_id, event_type, event_date) "
"SELECT household_id, citizen_id, 'Marriage', "
"DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 9131) "
"FROM citizen "
"WHERE date_of_birth < '2000-01-01';",

// divorce
"INSERT INTO census_data (household_id, citizen_id, event_type, event_date) "
"SELECT household_id, citizen_id, 'Divorce', "
"DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 1826) "
"FROM citizen "
"WHERE date_of_birth >= '1990-01-01' "
"AND date_of_birth <= '2000-12-31';"
};

// Execute CREATE TABLE statements
for (const auto& query : create_tables) {
    if (!execute_query(query)) {
        std::cerr << "Failed to create table\n";
        return;
    }
}

// Execute INSERT statements
for (const auto& query : insert_data) {
    if (!execute_query(query)) {
        std::cerr << "Failed to insert data\n";
        return;
    }
}

```

```

    }
}

std::vector<std::pair<std::string, std::string>> queries = {
    {
        "SELECT c.name "
        "FROM citizen c "
        "    JOIN land_record l ON c.citizen_id = l.citizen_id "
        "WHERE l.area_acres > 1",
        "Citizens with more than 1 acre of land"
    },
    {
        "SELECT c.name "
        "FROM household h "
        "    JOIN citizen c ON c.household_id = h.household_id "
        "WHERE h.income < 100000.00 "
        "    AND c.gender = 'F' "
        "    AND c.education_qualification in ('Primary', 'Secondary', '10th', '12th')",
        "Female students with low household income"
    },
    {
        "SELECT sum(area_acres) as total_acres "
        "FROM land_record "
        "WHERE crop_type = 'Rice'",
        "Total rice cultivation land"
    },
    {
        "SELECT count(citizen_id) as count "
        "FROM citizen "
        "WHERE date_of_birth > '2000-01-01' "
        "    AND education_qualification = '10th'",
        "Number of citizens born after 1.1.2000 with 10th class education"
    },
    {
        "SELECT c.name "
        "FROM citizen c "
        "    JOIN panchayat_employee pe ON c.citizen_id = pe.citizen_id "
        "    JOIN land_record l ON c.citizen_id = l.citizen_id "
        "WHERE l.area_acres > 1",
        "Panchayat employees who hold more than 1 acre land"
    },
    {
        "SELECT c.name "
        "FROM citizen c "
        "WHERE c.household_id = ("
        "    SELECT ci.household_id "
        "    FROM citizen ci "
        "        JOIN panchayat_employee pe ON ci.citizen_id = pe.citizen_id "
        "    WHERE pe.role = 'Panchayat Pradhan')",
        "Household members of Panchayat Pradhan"
    }
}

```

```

},
{
    "SELECT count(asset_id) as count "
    "FROM asset "
    "WHERE location = 'Phulera' "
    "    AND installation_date >= '2024-01-01' "
    "    AND installation_date <= '2024-12-31' "
    "    AND type = 'Street Light'",
    "Street lights installed in Phulera in 2024"
},
{
    "SELECT count(DISTINCT c.citizen_id) as count "
    "FROM citizen c "
    "    JOIN household h ON c.household_id = h.household_id "
    "    JOIN citizen c2 ON h.household_id = c2.household_id "
    "    JOIN vaccination v ON c2.citizen_id = v.citizen_id "
    "WHERE c.education_qualification = '10th' "
    "    AND v.date_administered >= '2024-01-01' "
    "    AND v.date_administered <= '2024-12-31' "
    "    AND c2.date_of_birth > c.date_of_birth "
    "    AND EXTRACT(YEAR FROM AGE(c2.date_of_birth)) <18",
    "Vaccinations for children of 10th pass citizens in 2024"
},
{
    "SELECT count(event_type) as count "
    "FROM census_data "
    "WHERE event_type = 'Birth' "
    "    AND event_date >= '2024-01-01' "
    "    AND event_date <= '2024-12-31'",
    "Total births in 2024"
},
{
    "SELECT count(citizen_id) as count "
    "FROM citizen "
    "WHERE household_id IN ("
    "    SELECT household_id "
    "    FROM citizen "
    "    WHERE citizen_id IN ("
    "        SELECT citizen_id "
    "        FROM panchayat_employee))",
    "Citizens in households with panchayat employees"
}
};

void execute_queries() {
    std::cout << "\nExecuting queries...\n";
    for (const auto& query : queries) {
        std::cout << "\n" << query.second << ":\n";
        SQLRETURN ret = SQLExecDirect(stmt, (SQLCHAR*)query.first.c_str(), SQL_NTS);

        if (SQL_SUCCEEDED(ret)) {

```

```

        while (SQL_SUCCEEDED(SQLFetch(stmt))) {
            SQLCHAR result[256];
            SQLLEN indicator;
            ret = SQLGetData(stmt, 1, SQL_C_CHAR, result, sizeof(result), &indicator);
            if (SQL_SUCCEEDED(ret) && indicator != SQL_NULL_DATA) {
                std::cout << result << "\n";
            }
        }
    } else {
        SQLError::extract_error("SQLExecDirect", stmt, SQL_HANDLE_STMT);
    }
    SQLCloseCursor(stmt);
}

void cleanup() {
    if (stmt) SQLFreeHandle(SQL_HANDLE_STMT, stmt);
    if (dbc) {
        SQLDisconnect(dbc);
        SQLFreeHandle(SQL_HANDLE_DBC, dbc);
    }
    if (env) SQLFreeHandle(SQL_HANDLE_ENV, env);
}

SQLHSTMT get_statement() const { return stmt; }

~DatabaseHandler() {
    cleanup();
}

};

int main() {
    DatabaseHandler db;

    if (!db.initialize()) {
        std::cerr << "Failed to initialize database handler\n";
        return 1;
    }

    std::string connStr = "DRIVER={PostgreSQL UNICODE};"
        "SERVER=10.5.18.72;"
        "PORT=5432;"
        "DATABASE=22CS30017;"
        "UID=22CS30017;"
        "PWD=Asdfghjkl@1234567890;";

    if (!db.connect(connStr)) {
        std::cerr << "Failed to connect to database\n";
        return 1;
    }
}

```



```

// Setup database tables and initial data
db.setup_database();

// Execute queries
db.execute_queries();

std::cout << "\nAll queries executed successfully.\n";
return 0;
}

```

- Output of executing 22CS30017_A3.cpp

Executing queries...

Citizens with more than 1 acre of land:

Amit Sharma
Anjali Gupta
Sneha Patel
Vikram Rao
Arjun Nair

Female students with low household income:

Anjali Gupta
Sneha Patel
Sunita Devi
Kamini Iyer
Child 3
Child 5
Child 9

Total rice cultivation land:

4.80

Number of citizens born after 1.1.2000 with 10th class education:

5

Panchayat employees who hold more than 1 acre land:

Amit Sharma
Vikram Rao
Arjun Nair

Household members of Panchayat Pradhan:

Amit Sharma
Neha Singh
Rahul Kumar
Raj Patel
Child 1

Street lights installed in Phulera in 2024:

4

Vaccinations for children of 10th pass citizens in 2024:

1

Total births in 2024:

11

Citizens in households with panchayat employees:

31

All queries executed successfully.

b) Python

```
import psycopg2

def main():
    conn_params = {
        "host": "10.5.18.72",
        "database": "22CS30017",
        "user": "22CS30017",
        "password": "Asdfghjkl@1234567890",
        "port": "5432"
    }

    try:
        # Connect to database
        conn = psycopg2.connect(**conn_params)
        cursor = conn.cursor()

        print("Connected to database successfully\n")

        # Create tables and insert data
        create_tables(cursor)
        insert_data(cursor)
        conn.commit()

        # Execute queries
        execute_queries(cursor)

        # Close cursor and connection
        cursor.close()
        conn.close()

    except psycopg2.Error as e:
        print(f"Error: {e}")

def create_tables(cursor):
    # Drop existing tables
    drop_tables = """
        DROP TABLE IF EXISTS household, citizen, land_record, panchayat_employee,
        asset, welfare_scheme, scheme_enrollment, vaccination, census_data CASCADE;
    """
    cursor.execute(drop_tables)

    # Create tables
    tables = [
        """
        CREATE TABLE household (
            household_id INT PRIMARY KEY,
            address TEXT NOT NULL,
            income DECIMAL(10, 2) NOT NULL
        );
        """,
    ],
```

```

"""
CREATE TABLE citizen (
    citizen_ID INT PRIMARY KEY,
    name VARCHAR(100) NOT NULL,
    gender CHAR(1) NOT NULL,
    date_of_birth DATE NOT NULL,
    household_id INT,
    education_qualification VARCHAR(50),
    FOREIGN KEY (household_id) REFERENCES household(household_id)
);
""",
"""
CREATE TABLE land_record (
    land_id INT PRIMARY KEY,
    citizen_id INT,
    area_acres DECIMAL(10, 2) NOT NULL,
    crop_type TEXT NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
""",
"""
CREATE TABLE panchayat_employee (
    employee_id INT PRIMARY KEY,
    citizen_id INT,
    role TEXT NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
""",
"""
CREATE TABLE asset (
    asset_id INT PRIMARY KEY,
    type TEXT NOT NULL,
    location TEXT NOT NULL,
    installation_date DATE NOT NULL
);
""",
"""
CREATE TABLE welfare_scheme (
    scheme_id INT PRIMARY KEY,
    name TEXT NOT NULL,
    description TEXT
);
""",
"""
CREATE TABLE scheme_enrollment (
    enrollment_id INT PRIMARY KEY,
    citizen_id INT,
    scheme_id INT,
    enrollment_date DATE NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id),
    FOREIGN KEY (scheme_id) REFERENCES welfare_scheme(scheme_id)
)

```

```

);
"""
"""

CREATE TABLE vaccination (
    vaccination_id INT PRIMARY KEY,
    citizen_id INT,
    vaccine_type TEXT NOT NULL,
    date_administered DATE NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
"""
"""

CREATE TABLE census_data (
    household_id INT,
    citizen_id INT,
    event_type TEXT NOT NULL,
    event_date DATE NOT NULL,
    FOREIGN KEY (household_id) REFERENCES household(household_id),
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
"""
]

for table in tables:
    cursor.execute(table)

def insert_data(cursor):
    # Insert household data
    household_data = """
        INSERT INTO household (household_id, address, income) VALUES
        (1, '123, MG Road, Mumbai', 95000.00),
        (2, '456, Park Street, Kolkata', 125000.00),
        (3, '789, Brigade Road, Bangalore', 75000.00),
        (4, '101, Anna Salai, Chennai', 145000.00),
        (5, '202, Connaught Place, Delhi', 82000.00),
        (6, '303, Banjara Hills, Hyderabad', 102500.00),
        (7, '404, Marine Drive, Kochi', 98000.00),
        (8, '505, Law Garden, Ahmedabad', 110000.00),
        (9, '606, Civil Lines, Jaipur', 87000.00),
        (10, '707, Rajwada, Indore', 130000.00);
    """

    cursor.execute(household_data)

    # Insert citizen data
    citizen_data = """
        INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification) VALUES
        (1, 'Amit Sharma', 'M', '1990-05-12', 1, 'Graduate'),
        (2, 'Priya Singh', 'F', '2005-09-15', 2, '10th'),
        (3, 'Anjali Gupta', 'F', '2010-11-25', 3, 'Primary'),
        (4, 'Rohit Verma', 'M', '1998-01-20', 4, '12th'),

```

```

(5, 'Sneha Patel', 'F', '2012-03-05', 5, 'Primary'),
(6, 'Vikram Rao', 'M', '1985-07-19', 6, 'Post-Graduate'),
(7, 'Pooja Mehta', 'F', '2008-08-17', 10, '12th'),
(8, 'Arjun Nair', 'M', '2000-12-30', 8, 'Secondary'),
(9, 'Kavya Iyer', 'F', '2003-04-14', 9, 'Graduate'),
(10, 'Rohan Desai', 'M', '2015-06-10', 10, 'Primary'),
(11, 'Neha Singh', 'F', '1995-02-28', 1, 'Post-Graduate'),
(12, 'Rajesh Kumar', 'M', '1980-10-05', 2, 'Graduate'),
(13, 'Sunita Devi', 'F', '1975-12-15', 3, 'Secondary'),
(14, 'Rahul Kumar', 'M', '2002-05-12', 1, '10th'),
(15, 'Meena Sharma', 'F', '1965-06-05', 5, 'Graduate'),
(16, 'Ramesh Patel', 'M', '1960-07-19', 6, 'Secondary'),
(17, 'Geeta Rao', 'F', '1955-08-17', 7, 'Post-Graduate'),
(18, 'Rajesh Nair', 'M', '1950-12-30', 8, 'Graduate'),
(19, 'Kamini Iyer', 'F', '1945-04-14', 9, 'Secondary'),
(20, 'Raj Desai', 'M', '1940-06-10', 10, 'Post-Graduate'),
(21, 'Vijay Singh', 'M', '1970-04-20', 4, 'Post-Graduate'),
(22, 'Sita Devi', 'F', '2004-09-15', 2, '10th'),
(23, 'Mohan Das', 'M', '2001-11-25', 3, '10th'),
(24, 'Gita Verma', 'F', '1999-01-20', 4, '12th'),
(25, 'Raj Patel', 'M', '2013-03-05', 1, 'Primary'),
(26, 'Meena Rao', 'F', '1986-07-19', 6, 'Post-Graduate'),
(27, 'Ramesh Mehta', 'M', '2009-08-17', 7, '10th'),
(28, 'Geeta Nair', 'F', '2002-12-30', 8, 'Secondary'),
(29, 'Rajesh Iyer', 'M', '2005-04-14', 9, 'Graduate'),
(30, 'Kamal Desai', 'M', '2016-06-10', 10, 'Primary'),
(31, 'eheh', 'M', '2024-04-04', 3, 'Primary');

"""

cursor.execute(citizen_data)

# Insert land record data
land_record_data = """
    INSERT INTO land_record (land_id, citizen_id, area_acres, crop_type) VALUES
    (1, 1, 1.5, 'Rice'),
    (2, 2, 0.8, 'Wheat'),
    (3, 3, 2.0, 'Cotton'),
    (4, 4, 0.5, 'Rice'),
    (5, 5, 1.2, 'Maize'),
    (6, 6, 1.8, 'Rice'),
    (7, 7, 0.6, 'Wheat'),
    (8, 8, 2.5, 'Sugarcane'),
    (9, 9, 1.0, 'Rice'),
    (10, 10, 0.9, 'Cotton');
"""

cursor.execute(land_record_data)

# Insert panchayat employee data
panchayat_employee_data = """
    INSERT INTO panchayat_employee (employee_id, citizen_id, role) VALUES
    (1, 1, 'Panchayat Pradhan'),
    (2, 2, 'Secretary'),

```

```

(3, 6, 'Member'),
(4, 8, 'Treasurer'),
(5, 10, 'Member'),
(6, 11, 'Vice President'),
(7, 12, 'Member'),
(8, 16, 'Secretary'),
(9, 18, 'Auditor'),
(10, 20, 'Treasurer'),
(11, 21, 'Clerk'),
(12, 22, 'Supervisor'),
(13, 23, 'Assistant'),
(14, 24, 'Coordinator'),
(15, 25, 'Advisor');

"""

cursor.execute(panchayat_employee_data)

# Insert asset data
asset_data = """
INSERT INTO asset (asset_id, type, location, installation_date) VALUES
(1, 'Street Light', 'Phulera', '2024-01-15'),
(2, 'Street Light', 'Phulera', '2024-02-20'),
(3, 'Water Pump', 'XYZ Village', '2023-08-10'),
(4, 'Road', 'ABC Village', '2022-09-05'),
(5, 'Street Light', 'Phulera', '2024-03-18'),
(6, 'Water Pump', 'XYZ Village', '2023-10-25'),
(7, 'Road', 'ABC Village', '2022-11-30'),
(8, 'Street Light', 'Phulera', '2024-04-15'),
(9, 'Water Pump', 'XYZ Village', '2023-12-20'),
(10, 'Road', 'ABC Village', '2023-01-25'),
(11, 'Street Light', 'XYZ Village', '2024-05-10'),
(12, 'Street Light', 'ABC Village', '2024-06-15'),
(13, 'Street Light', 'LMN Village', '2024-07-20'),
(14, 'Street Light', 'PQR Village', '2024-08-25'),
(15, 'Street Light', 'DEF Village', '2024-09-30');

"""

cursor.execute(asset_data)

# Insert welfare scheme data
welfare_scheme_data = """
INSERT INTO welfare_scheme (scheme_id, name, description) VALUES
(1, 'MNREGA', 'Employment Guarantee Scheme'),
(2, 'PMAY', 'Affordable Housing Scheme'),
(3, 'Midday Meal', 'School Lunch Program'),
(4, 'PMKSY', 'Irrigation Scheme'),
(5, 'PMFBY', 'Crop Insurance Scheme');

"""

cursor.execute(welfare_scheme_data)

# Insert scheme enrollment data
scheme_enrollment_data = """
INSERT INTO scheme_enrollment (enrollment_id, citizen_id, scheme_id, enrollment_date) VALUES

```

```

(1, 2, 1, '2023-07-10'),
(2, 3, 2, '2024-01-15'),
(3, 4, 3, '2024-02-01'),
(4, 5, 1, '2024-03-20'),
(5, 6, 2, '2024-04-05'),
(6, 7, 3, '2024-05-10'),
(7, 8, 1, '2024-06-15'),
(8, 9, 2, '2024-07-20'),
(9, 10, 3, '2024-08-25');

"""

cursor.execute(scheme_enrollment_data)

# Insert vaccination data
vaccination_data = """
    INSERT INTO vaccination (vaccination_id, citizen_id, vaccine_type, date_administered) VALUES
    (1, 5, 'Covid-19', '2024-05-20'),
    (2, 7, 'Polio', '2024-03-10'),
    (3, 10, 'Hepatitis', '2024-06-15'),
    (4, 1, 'Covid-19', '2024-07-20'),
    (5, 3, 'Polio', '2024-08-10'),
    (6, 31, 'Polio', '2024-06-06');
"""

cursor.execute(vaccination_data)

# add child birth events in citizen data for year 2024
child_birth_data = """
    INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification)
    SELECT
        ((SELECT MAX(citizen_id) FROM citizen) + ROW_NUMBER() OVER (ORDER BY h.household_id),
        'Child ' || ROW_NUMBER() OVER (ORDER BY h.household_id),
        CASE WHEN RANDOM() < 0.5 THEN 'M' ELSE 'F' END,
        DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365),
        h.household_id,
        'Primary'
    FROM household h
    WHERE h.household_id IN (SELECT household_id FROM household);
"""

cursor.execute(child_birth_data)

# census data
census_data = """
    INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
    SELECT household_id, citizen_id, 'Birth', date_of_birth
    FROM citizen
    WHERE date_of_birth IS NOT NULL;
"""

cursor.execute(census_data)

# query to add death event
death_data = """

```



```

INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
SELECT household_id, citizen_id, 'Death',
       DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365)
FROM citizen
WHERE citizen_id NOT IN (SELECT citizen_id FROM panchayat_employee)
  AND date_of_birth < '1980-01-01';
"""

cursor.execute(death_data)

# query to add marriage event
marriage_data = """
    INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
    SELECT household_id, citizen_id, 'Marriage',
           DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 9131)
    FROM citizen
    WHERE date_of_birth < '2000-01-01';
"""

cursor.execute(marriage_data)

# query to add divorce event
divorce_data = """
    INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
    SELECT household_id, citizen_id, 'Divorce',
           DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 1826)
    FROM citizen
    WHERE date_of_birth >= '1990-01-01'
      AND date_of_birth <= '2000-12-31';
"""

cursor.execute(divorce_data)

def execute_queries(cursor):
    queries = [
        # Query 1: Citizens with more than 1 acre of land
        """
        SELECT c.name
        FROM citizen c
        JOIN land_record l
        ON c.citizen_id = l.citizen_id
        WHERE l.area_acres > 1;
        """,

        # Query 2: Female students with low household income
        """
        SELECT c.name
        FROM household h
        JOIN citizen c
        ON c.household_id = h.household_id
        WHERE h.income < 100000.00
          AND c.gender = 'F'
          AND c.education_qualification in ('Primary', 'Secondary', '10th', '12th');
        """
    ]

```

```
""",

# Query 3: Total rice cultivation land
"""

SELECT sum(area_acres) as total_acres
      FROM land_record
      WHERE crop_type = 'Rice';
""",

# Number of citizens who are born after 1.1.2000 and have educational qualification of 10th
class
"""

SELECT count(citizen_id) as count
      FROM citizen
      WHERE date_of_birth > '2000-01-01'
            AND education_qualification = '10th';
""",

# Name of all employees of panchayat who also hold more than 1 acre land
"""

SELECT c.name
      FROM citizen c
            JOIN panchayat_employee pe
                  ON c.citizen_id = pe.citizen_id
            JOIN land_record l
                  ON c.citizen_id = l.citizen_id
      WHERE l.area_acres > 1;
""",

# Name of the household members of Panchayat Pradhan
"""

SELECT c.name
      FROM citizen c
      WHERE c.household_id = (
            SELECT ci.household_id
            FROM citizen ci
                  JOIN panchayat_employee pe
                        ON ci.citizen_id = pe.citizen_id
            WHERE pe.role = 'Panchayat Pradhan'
        );
""",

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

SELECT count(asset_id) as count
      FROM asset
      WHERE location = 'Phulera'
            AND installation_date >= '2024-01-01'
            AND installation_date <= '2024-12-31'
            AND type = 'Street Light';
```

```

"""

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

SELECT count(DISTINCT c.citizen_id) as count
    FROM citizen c
        -- Join household to get household details of the citizen
        JOIN household h ON c.household_id = h.household_id
        -- Join citizen again to get other members of the same household
        JOIN citizen c2 ON h.household_id = c2.household_id
        -- Join vaccination to get vaccination details of household members
        JOIN vaccination v ON c2.citizen_id = v.citizen_id
    WHERE c.education_qualification = '10th' -- Filter citizens with education qualification
of class 10
        AND v.date_administered >= '2024-01-01' -- Filter vaccinations administered in 2024
        AND v.date_administered <= '2024-12-31'
        AND c2.date_of_birth > c.date_of_birth -- Filter children of the citizens
        AND EXTRACT(YEAR FROM AGE(c2.date_of_birth)) < 18; -- Check if child's age is less
than 18
"""

# Total number of births of boy child in the year 2024
"""

SELECT count(event_type) as count
    FROM census_data
    WHERE event_type = 'Birth'
        AND event_date >= '2024-01-01'
        AND event_date <= '2024-12-31';
"""

# Number of citizens who belong to the household of at least one panchayat employee
"""

SELECT count(citizen_id) as count
    FROM citizen
    WHERE household_id IN
        (
            SELECT household_id
                FROM citizen
            WHERE citizen_id IN
                (
                    SELECT citizen_id
                        FROM panchayat_employee
                )
        )
    );
"""

]

# Execute each query
for i, query in enumerate(queries):

```

```

print(f"\nQuery {i+1}:")
cursor.execute(query)
rows = cursor.fetchall()

if not rows:
    print("No results found")
    continue

# Get column names
colnames = [desc[0] for desc in cursor.description]

# Get max width for each column
widths = []
for col in range(len(colnames)):
    # Include column name length in width calculation
    width = len(colnames[col])
    # Check width of data in this column
    for row in rows:
        width = max(width, len(str(row[col])))
    widths.append(width + 2) # Add padding

# Print header
header = ""
separator = ""
for i, col in enumerate(colnames):
    header += f" {col:<{widths[i]}}"
    separator += "-" * (widths[i] + 1)

print(header)
print(separator)

# Print rows
for row in rows:
    line = ""
    for i, val in enumerate(row):
        line += f" {str(val):<{widths[i]}}"
    print(line)

print(f"({len(rows)} rows)")

if __name__ == "__main__":
    main()

```

- Output of executing 22CS30017_A3.py

Connected to database successfully

Query 1:
name

Amit Sharma
Anjali Gupta
Sneha Patel
Vikram Rao
Arjun Nair
(5 rows)

Query 2:
name

Anjali Gupta
Sneha Patel
Sunita Devi
Kamini Iyer
Child 1
Child 9
(6 rows)

Query 3:
total_acres

4.80
(1 rows)

Query 4:
count

5
(1 rows)

Query 5:
name

Amit Sharma
Vikram Rao
Arjun Nair
(3 rows)

Query 6:
name

Amit Sharma
Neha Singh
Rahul Kumar
Raj Patel
Child 1
(5 rows)

Query 7:
count

4
(1 rows)

Query 8:

count

1

(1 rows)

Query 9:

count

11

(1 rows)

Query 10:

count

31

(1 rows)

c) JAVA

```
import java.sql.*;

// javac -cp postgresql-42.7.1.jar PanchayatJDBC.java
// java -cp .:postgresql-42.7.1.jar PanchayatJDBC

public class PanchayatJDBC {
    public static void main(String[] args) {
        String url = "jdbc:postgresql://10.5.18.72:5432/22CS30017";
        String user = "22CS30017";
        String password = "Asdfghjkl@1234567890";

        try {
            // Load the PostgreSQL JDBC driver
            Class.forName("org.postgresql.Driver");

            // Establish the connection
            Connection conn = DriverManager.getConnection(url, user, password);
            System.out.println("Connected to the PostgreSQL server successfully.\n");

            // Create tables
            createTables(conn);

            // Insert data
            insertData(conn);

            // Execute queries
            executeQueries(conn);

            // Close connection
            conn.close();

        } catch (Exception e) {
            e.printStackTrace();
        }
    }

    private static void createTables(Connection conn) throws SQLException {
        Statement stmt = conn.createStatement();

        // Drop existing tables
        String dropTables = ""
            DROP TABLE IF EXISTS household, citizen, land_record, panchayat_employee,
            asset, welfare_scheme, scheme_enrollment, vaccination, census_data;
        """;
        stmt.execute(dropTables);

        // Create tables
        String createHousehold = ""
            CREATE TABLE household (
                household_id INT PRIMARY KEY,
```

```

        address TEXT NOT NULL,
        income DECIMAL(10, 2) NOT NULL
    );
""";
stmt.execute(createHousehold);

String createCitizen = ""
    CREATE TABLE citizen (
        citizen_ID INT PRIMARY KEY,
        name VARCHAR(100) NOT NULL,
        gender CHAR(1) NOT NULL,
        date_of_birth DATE NOT NULL,
        household_id INT,
        education_qualification VARCHAR(50),
        FOREIGN KEY (household_id) REFERENCES household(household_id)
    );
""";
stmt.execute(createCitizen);

String createLandRecord = ""
    CREATE TABLE land_record (
        land_id INT PRIMARY KEY,
        citizen_id INT,
        area_acres DECIMAL(10, 2) NOT NULL,
        crop_type TEXT NOT NULL,
        FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
    );
""";
stmt.execute(createLandRecord);

String createPanchayatEmployee = ""
CREATE TABLE panchayat_employee (
    employee_id INT PRIMARY KEY,
    citizen_id INT,
    role TEXT NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
""";
stmt.execute(createPanchayatEmployee);

String createAsset = ""
CREATE TABLE asset (
    asset_id INT PRIMARY KEY,
    type TEXT NOT NULL,
    location TEXT NOT NULL,
    installation_date DATE NOT NULL
);
""";
stmt.execute(createAsset);

```



```

String createWelfareScheme = ""
CREATE TABLE welfare_scheme (
    scheme_id INT PRIMARY KEY,
    name TEXT NOT NULL,
    description TEXT
);
"";
stmt.execute(createWelfareScheme);

String createSchemeEnrollment = ""
CREATE TABLE scheme_enrollment (
    enrollment_id INT PRIMARY KEY,
    citizen_id INT,
    scheme_id INT,
    enrollment_date DATE NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id),
    FOREIGN KEY (scheme_id) REFERENCES welfare_scheme(scheme_id)
);
"";
stmt.execute(createSchemeEnrollment);

String createVaccination = ""
CREATE TABLE vaccination (
    vaccination_id INT PRIMARY KEY,
    citizen_id INT,
    vaccine_type TEXT NOT NULL,
    date_administered DATE NOT NULL,
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
"";
stmt.execute(createVaccination);

String createCensusData = ""
CREATE TABLE census_data (
    household_id INT,
    citizen_id INT,
    event_type TEXT NOT NULL,
    event_date DATE NOT NULL,
    FOREIGN KEY (household_id) REFERENCES household(household_id),
    FOREIGN KEY (citizen_id) REFERENCES citizen(citizen_id)
);
"";
stmt.execute(createCensusData);

stmt.close();
}

private static void insertData(Connection conn) throws SQLException {
    Statement stmt = conn.createStatement();

    // Insert household data

```

```
String insertHouseholds = ""
    INSERT INTO household (household_id, address, income) VALUES
    (1, '123, MG Road, Mumbai', 95000.00),
    (2, '456, Park Street, Kolkata', 125000.00),
    (3, '789, Brigade Road, Bangalore', 75000.00),
    (4, '101, Anna Salai, Chennai', 145000.00),
    (5, '202, Connaught Place, Delhi', 82000.00),
    (6, '303, Banjara Hills, Hyderabad', 102500.00),
    (7, '404, Marine Drive, Kochi', 98000.00),
    (8, '505, Law Garden, Ahmedabad', 110000.00),
    (9, '606, Civil Lines, Jaipur', 87000.00),
    (10, '707, Rajwada, Indore', 130000.00);
"";

stmt.execute(insertHouseholds);

// insert citizen data
String insertCitizens = ""
    INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification) VALUES
    (1, 'Amit Sharma', 'M', '1990-05-12', 1, 'Graduate'),
    (2, 'Priya Singh', 'F', '2005-09-15', 2, '10th'),
    (3, 'Anjali Gupta', 'F', '2010-11-25', 3, 'Primary'),
    (4, 'Rohit Verma', 'M', '1998-01-20', 4, '12th'),
    (5, 'Sneha Patel', 'F', '2012-03-05', 5, 'Primary'),
    (6, 'Vikram Rao', 'M', '1985-07-19', 6, 'Post-Graduate'),
    (7, 'Pooja Mehta', 'F', '2008-08-17', 10, '12th'),
    (8, 'Arjun Nair', 'M', '2000-12-30', 8, 'Secondary'),
    (9, 'Kavya Iyer', 'F', '2003-04-14', 9, 'Graduate'),
    (10, 'Rohan Desai', 'M', '2015-06-10', 10, 'Primary'),
    (11, 'Neha Singh', 'F', '1995-02-28', 1, 'Post-Graduate'),
    (12, 'Rajesh Kumar', 'M', '1980-10-05', 2, 'Graduate'),
    (13, 'Sunita Devi', 'F', '1975-12-15', 3, 'Secondary'),
    (14, 'Rahul Kumar', 'M', '2002-05-12', 1, '10th'),
    (15, 'Meena Sharma', 'F', '1965-06-05', 5, 'Graduate'),
    (16, 'Ramesh Patel', 'M', '1960-07-19', 6, 'Secondary'),
    (17, 'Geeta Rao', 'F', '1955-08-17', 7, 'Post-Graduate'),
    (18, 'Rajesh Nair', 'M', '1950-12-30', 8, 'Graduate'),
    (19, 'Kamini Iyer', 'F', '1945-04-14', 9, 'Secondary'),
    (20, 'Raj Desai', 'M', '1940-06-10', 10, 'Post-Graduate'),
    (21, 'Vijay Singh', 'M', '1970-04-20', 4, 'Post-Graduate'),
    (22, 'Sita Devi', 'F', '2004-09-15', 2, '10th'),
    (23, 'Mohan Das', 'M', '2001-11-25', 3, '10th'),
    (24, 'Gita Verma', 'F', '1999-01-20', 4, '12th'),
    (25, 'Raj Patel', 'M', '2013-03-05', 1, 'Primary'),
    (26, 'Meena Rao', 'F', '1986-07-19', 6, 'Post-Graduate'),
    (27, 'Ramesh Mehta', 'M', '2009-08-17', 7, '10th'),
    (28, 'Geeta Nair', 'F', '2002-12-30', 8, 'Secondary'),
    (29, 'Rajesh Iyer', 'M', '2005-04-14', 9, 'Graduate'),
    (30, 'Kamal Desai', 'M', '2016-06-10', 10, 'Primary'),
    (31, 'eheh', 'M', '2024-04-04', 3, 'Primary');
"";
```

```
stmt.execute(insertCitizens);
```

```
String insertLandRecords = ""
```

```
    INSERT INTO land_record (land_id, citizen_id, area_acres, crop_type) VALUES
    (1, 1, 1.5, 'Rice'),
    (2, 2, 0.8, 'Wheat'),
    (3, 3, 2.0, 'Cotton'),
    (4, 4, 0.5, 'Rice'),
    (5, 5, 1.2, 'Maize'),
    (6, 6, 1.8, 'Rice'),
    (7, 7, 0.6, 'Wheat'),
    (8, 8, 2.5, 'Sugarcane'),
    (9, 9, 1.0, 'Rice'),
    (10, 10, 0.9, 'Cotton');
```

```
"";
```

```
stmt.execute(insertLandRecords);
```

```
String insertPanchayatEmployees = ""
```

```
    INSERT INTO panchayat_employee (employee_id, citizen_id, role) VALUES
    (1, 1, 'Panchayat Pradhan'),
    (2, 2, 'Secretary'),
    (3, 6, 'Member'),
    (4, 8, 'Treasurer'),
    (5, 10, 'Member'),
    (6, 11, 'Vice President'),
    (7, 12, 'Member'),
    (8, 16, 'Secretary'),
    (9, 18, 'Auditor'),
    (10, 20, 'Treasurer'),
    (11, 21, 'Clerk'),
    (12, 22, 'Supervisor'),
    (13, 23, 'Assistant'),
    (14, 24, 'Coordinator'),
    (15, 25, 'Advisor');
```

```
"";
```

```
stmt.execute(insertPanchayatEmployees);
```

```
String insertAssets = ""
```

```
    INSERT INTO asset (asset_id, type, location, installation_date) VALUES
    (1, 'Street Light', 'Phulera', '2024-01-15'),
    (2, 'Street Light', 'Phulera', '2024-02-20'),
    (3, 'Water Pump', 'XYZ Village', '2023-08-10'),
    (4, 'Road', 'ABC Village', '2022-09-05'),
    (5, 'Street Light', 'Phulera', '2024-03-18'),
    (6, 'Water Pump', 'XYZ Village', '2023-10-25'),
    (7, 'Road', 'ABC Village', '2022-11-30'),
    (8, 'Street Light', 'Phulera', '2024-04-15'),
    (9, 'Water Pump', 'XYZ Village', '2023-12-20'),
    (10, 'Road', 'ABC Village', '2023-01-25'),
    (11, 'Street Light', 'XYZ Village', '2024-05-10'),
    (12, 'Street Light', 'ABC Village', '2024-06-15'),
```

```

        (13, 'Street Light', 'LMN Village', '2024-07-20'),
        (14, 'Street Light', 'PQR Village', '2024-08-25'),
        (15, 'Street Light', 'DEF Village', '2024-09-30');
    """;
    stmt.execute(insertAssets);

    String insertWelfareSchemes = """
        INSERT INTO welfare_scheme (scheme_id, name, description) VALUES
        (1, 'MNREGA', 'Employment Guarantee Scheme'),
        (2, 'PMAY', 'Affordable Housing Scheme'),
        (3, 'Midday Meal', 'School Lunch Program'),
        (4, 'PMKSY', 'Irrigation Scheme'),
        (5, 'PMFBY', 'Crop Insurance Scheme');
    """;
    stmt.execute(insertWelfareSchemes);

    String insertSchemeEnrollments = """
        INSERT INTO scheme_enrollment (enrollment_id, citizen_id, scheme_id, enrollment_date) VALUES
        (1, 2, 1, '2023-07-10'),
        (2, 3, 2, '2024-01-15'),
        (3, 4, 3, '2024-02-01'),
        (4, 5, 1, '2024-03-20'),
        (5, 6, 2, '2024-04-05'),
        (6, 7, 3, '2024-05-10'),
        (7, 8, 1, '2024-06-15'),
        (8, 9, 2, '2024-07-20'),
        (9, 10, 3, '2024-08-25');
    """;
    stmt.execute(insertSchemeEnrollments);

    String insertVaccinations = """
        INSERT INTO vaccination (vaccination_id, citizen_id, vaccine_type, date_administered) VALUES
        (1, 5, 'Covid-19', '2024-05-20'),
        (2, 7, 'Polio', '2024-03-10'),
        (3, 10, 'Hepatitis', '2024-06-15'),
        (4, 1, 'Covid-19', '2024-07-20'),
        (5, 3, 'Polio', '2024-08-10'),
        (6, 31, 'Polio', '2024-06-06');
    """;
    stmt.execute(insertVaccinations);

    String insertCensusData = """
        INSERT INTO citizen (citizen_id, name, gender, date_of_birth, household_id,
education_qualification)
        SELECT
            (SELECT MAX(citizen_id) FROM citizen) + ROW_NUMBER() OVER (ORDER BY h.household_id),
            'Child ' || ROW_NUMBER() OVER (ORDER BY h.household_id),
            CASE WHEN RANDOM() < 0.5 THEN 'M' ELSE 'F' END,
            DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365),
            h.household_id,
            'Primary'
    """;

```

```

        FROM household h
        WHERE h.household_id IN (SELECT household_id FROM household);
    """;
    stmt.execute(insertCensusData);

    String census_data = """
        INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
        SELECT household_id, citizen_id, 'Birth', date_of_birth
        FROM citizen
        WHERE date_of_birth IS NOT NULL;
    """;
    stmt.execute(census_data);

    String death_data = """
        INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
        SELECT household_id, citizen_id, 'Death',
            DATE '2024-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 365)
        FROM citizen
        WHERE citizen_id NOT IN (SELECT citizen_id FROM panchayat_employee)
            AND date_of_birth < '1980-01-01';
    """;
    stmt.execute(death_data);

    String marriage_data = """
        INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
        SELECT household_id, citizen_id, 'Marriage',
            DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 9131)
        FROM citizen
        WHERE date_of_birth < '2000-01-01';
    """;
    stmt.execute(marriage_data);

    String divorce_data = """
        INSERT INTO census_data (household_id, citizen_id, event_type, event_date)
        SELECT household_id, citizen_id, 'Divorce',
            DATE '2000-01-01' + INTERVAL '1' DAY * FLOOR(RANDOM() * 1826)
        FROM citizen
        WHERE date_of_birth >= '1990-01-01'
            AND date_of_birth <= '2000-12-31';
    """;
    stmt.execute(divorce_data);

    stmt.close();
}

private static void executeQueries(Connection conn) throws SQLException {
    // Query 1: Citizens with more than 1 acre of land
    String query1 = """
        SELECT c.name
        FROM citizen c
    """;

```

```

        JOIN land_record l ON c.citizen_id = l.citizen_id
        WHERE l.area_acres > 1;
    """;

    Statement stmt1 = conn.createStatement();
    ResultSet rs1 = stmt1.executeQuery(query1);

    System.out.println("Citizens with more than 1 acre of land:");
    System.out.println("Name");
    System.out.println("-----");
    while (rs1.next()) {
        System.out.println(rs1.getString("name"));
    }
    System.out.println();

    // Query 2: Female students with household income < 1 Lakh
    String query2 = """
        SELECT c.name
        FROM household h
        JOIN citizen c ON c.household_id = h.household_id
        WHERE h.income < 100000.00
        AND c.gender = 'F'
        AND c.education_qualification in ('Primary', 'Secondary', '10th', '12th');
    """;

    Statement stmt2 = conn.createStatement();
    ResultSet rs2 = stmt2.executeQuery(query2);

    System.out.println("Female students with household income < 1 Lakh:");
    System.out.println("Name");
    System.out.println("-----");
    while (rs2.next()) {
        System.out.println(rs2.getString("name"));
    }
    System.out.println();

    // Query 3: Total rice cultivation land
    String query3 = """
        SELECT sum(area_acres) as total_acres
        FROM land_record
        WHERE crop_type = 'Rice';
    """;

    Statement stmt3 = conn.createStatement();
    ResultSet rs3 = stmt3.executeQuery(query3);

    System.out.println("Total rice cultivation land:");
    System.out.println("Total Acres");
    System.out.println("-----");
    while (rs3.next()) {
        System.out.println(rs3.getDouble("total_acres"));
    }

```

```

}
System.out.println();

// Query 4: Citizens born after 1.1.2000 with 10th education
String query4 = ""
    SELECT count(citizen_id) as count
    FROM citizen
    WHERE date_of_birth > '2000-01-01'
    AND education_qualification = '10th';
"";

Statement stmt4 = conn.createStatement();
ResultSet rs4 = stmt4.executeQuery(query4);

System.out.println("Number of citizens born after 1.1.2000 with 10th education:");
System.out.println("Count");
System.out.println("-----");
while (rs4.next()) {
    System.out.println(rs4.getInt("count"));
}
System.out.println();

// Query 5: Panchayat employees with more than 1 acre land
String query5 = ""
    SELECT c.name
    FROM citizen c
    JOIN panchayat_employee pe ON c.citizen_id = pe.citizen_id
    JOIN land_record l ON c.citizen_id = l.citizen_id
    WHERE l.area_acres > 1;
"";

Statement stmt5 = conn.createStatement();
ResultSet rs5 = stmt5.executeQuery(query5);

System.out.println("Panchayat employees with more than 1 acre land:");
System.out.println("Name");
System.out.println("-----");
while (rs5.next()) {
    System.out.println(rs5.getString("name"));
}
System.out.println();

// Query 6: Household members of Panchayat Pradhan
String query6 = ""
    SELECT c.name
    FROM citizen c
    WHERE c.household_id = (
        SELECT ci.household_id
        FROM citizen ci
        JOIN panchayat_employee pe ON ci.citizen_id = pe.citizen_id
        WHERE pe.role = 'Panchayat Pradhan'
    );

```

```

    );
    """;

    Statement stmt6 = conn.createStatement();
    ResultSet rs6 = stmt6.executeQuery(query6);

    System.out.println("Household members of Panchayat Pradhan:");
    System.out.println("Name");
    System.out.println("-----");
    while (rs6.next()) {
        System.out.println(rs6.getString("name"));
    }
    System.out.println();

    // Query 7: Street lights in Phulera installed in 2024
    String query7 = """
        SELECT count(asset_id) as count
        FROM asset
        WHERE location = 'Phulera'
        AND installation_date >= '2024-01-01'
        AND installation_date <= '2024-12-31'
        AND type = 'Street Light';
    """;

    Statement stmt7 = conn.createStatement();
    ResultSet rs7 = stmt7.executeQuery(query7);

    System.out.println("Street lights in Phulera installed in 2024:");
    System.out.println("Count");
    System.out.println("-----");
    while (rs7.next()) {
        System.out.println(rs7.getInt("count"));
    }
    System.out.println();

    // Query 8: Vaccinations in 2024 for children of 10th pass citizens
    String query8 = """
        SELECT count(DISTINCT c.citizen_id) as count
        FROM citizen c
        JOIN household h ON c.household_id = h.household_id
        JOIN citizen c2 ON h.household_id = c2.household_id
        JOIN vaccination v ON c2.citizen_id = v.citizen_id
        WHERE c.education_qualification = '10th'
        AND v.date_administered >= '2024-01-01'
        AND v.date_administered <= '2024-12-31'
        AND c2.date_of_birth > c.date_of_birth
        AND EXTRACT(YEAR FROM AGE(c2.date_of_birth)) < 18;
    """;

    Statement stmt8 = conn.createStatement();
    ResultSet rs8 = stmt8.executeQuery(query8);

```



```

System.out.println("Vaccinations in 2024 for children of 10th pass citizens:");
System.out.println("Count");
System.out.println("-----");
while (rs8.next()) {
    System.out.println(rs8.getInt("count"));
}
System.out.println();

// Query 9: Boy births in 2024
String query9 = ""
    SELECT count(event_type) as count
    FROM census_data
    WHERE event_type = 'Birth'
    AND event_date >= '2024-01-01'
    AND event_date <= '2024-12-31';
"";

Statement stmt9 = conn.createStatement();
ResultSet rs9 = stmt9.executeQuery(query9);

System.out.println("Boy births in 2024:");
System.out.println("Count");
System.out.println("-----");
while (rs9.next()) {
    System.out.println(rs9.getInt("count"));
}
System.out.println();

// Query 10: Citizens in panchayat employee households
String query10 = ""
    SELECT count(citizen_id) as count
    FROM citizen
    WHERE household_id IN (
        SELECT household_id
        FROM citizen
        WHERE citizen_id IN (
            SELECT citizen_id
            FROM panchayat_employee
        )
    );
"";

Statement stmt10 = conn.createStatement();
ResultSet rs10 = stmt10.executeQuery(query10);

System.out.println("Citizens in panchayat employee households:");
System.out.println("Count");
System.out.println("-----");
while (rs10.next()) {
    System.out.println(rs10.getInt("count"));
}

```

```

    }
    System.out.println();

    // Close all resources
    rs1.close(); stmt1.close();
    rs2.close(); stmt2.close();
    rs3.close(); stmt3.close();
    rs4.close(); stmt4.close();
    rs5.close(); stmt5.close();
    rs6.close(); stmt6.close();
    rs7.close(); stmt7.close();
    rs8.close(); stmt8.close();
    rs9.close(); stmt9.close();
    rs10.close(); stmt10.close();
}
}

```

- Output of executing PanchayatJDBC.java

Connected to the PostgreSQL server successfully.

Citizens with more than 1 acre of land:

Name

Amit Sharma

Anjali Gupta

Sneha Patel

Vikram Rao

Arjun Nair

Female students with household income < 1 Lakh:

Name

Anjali Gupta

Sneha Patel

Sunita Devi

Kamini Iyer

Child 9

Total rice cultivation land:

Total Acres

4.8

Number of citizens born after 1.1.2000 with 10th education:

Count

5

Panchayat employees with more than 1 acre land:

Name

Amit Sharma
Vikram Rao
Arjun Nair

Household members of Panchayat Pradhan:
Name

Amit Sharma
Neha Singh
Rahul Kumar
Raj Patel
Child 1

Street lights in Phulera installed in 2024:
Count

4

Vaccinations in 2024 for children of 10th pass citizens:
Count

1

Boy births in 2024:
Count

11

Citizens in panchayat employee households:
Count

31