DBMS ASSIGNMENT 3
22CS30016
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The queries were executed in 3 different higher-level programming languages using appropriate connection libraries.
JDBC for Java, **ODBC** for C++, **psycopg2** for Python.

Java Code :

```
// import all java classes related to SQL
import java.sql.*;

// main class
public class PanchayatDatabaseQueries {
   // all the database connection details, 5432 is the default port for PostgreSQL
   private static final String URL = "jdbc:postgresql://localhost:5432/omkar";
   private static final String USER = "omkar";
   private static final String PASSWORD = "tans";

   // main method, for connecting to the database and executing queries
   public static void main(String[] args) {
       try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD)) {
           executeQueries(conn);
       } catch (SQLException e) {
           e.printStackTrace();
       }
   }

   // all queries stated here
   private static void executeQueries(Connection conn) throws SQLException {
            String queryA = "SELECT c.name FROM citizens c JOIN assets a ON c.citizen_id =
a.citizen_owner_id JOIN lands l ON a.asset_id = l.asset_id WHERE l.area_in_acres > 1;";
       executeAndPrintQuery(conn, queryA, "Query A:");

         String queryB = "SELECT c.name FROM citizens c JOIN households h ON c.house_no = h.house_no
WHERE c.gender = 'Female' AND (c.edu_level = '10th' OR c.edu_level = '12th') AND h.total_income <
100000;";
       executeAndPrintQuery(conn, queryB, "Query B:");

        String queryC = "SELECT SUM(l.area_in_acres) AS total_acres_rice FROM lands l WHERE l.crop_type
= 'Rice';";
       executeAndPrintQuery(conn, queryC, "Query C:");

         String queryD = "SELECT COUNT(*) FROM citizens c WHERE c.dob > '2000-01-01' AND c.edu_level =
'10th';";
       executeAndPrintQuery(conn, queryD, "Query D:");

          String queryE = "SELECT c.name FROM citizens c JOIN panchayat_members pm ON c.citizen_id =
pm.citizen_id JOIN assets a ON c.citizen_id = a.citizen_owner_id JOIN lands l ON a.asset_id =
l.asset_id WHERE l.area_in_acres > 1;";
       executeAndPrintQuery(conn, queryE, "Query E:");
```

```
        String queryF = "SELECT c.name FROM citizens c WHERE c.house_no = (SELECT h.house_no FROM households h JOIN citizens c ON c.house_no = h.house_no JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id WHERE pm.designation = 'Pradhan') AND c.citizen_id NOT IN (SELECT pm.citizen_id FROM panchayat_members pm WHERE pm.designation = 'Pradhan');";
        executeAndPrintQuery(conn, queryF, "Query F:");

        String queryG = "SELECT SUM(a.value) AS total_value FROM assets a WHERE a.type = 'Street Light' AND a.location = 'Phulera' AND EXTRACT(YEAR FROM a.date_of_acquisition) = 2024;";
        executeAndPrintQuery(conn, queryG, "Query G:");

        String queryH = "SELECT COUNT(DISTINCT c.citizen_id) FROM beneficiaries b JOIN citizens c ON b.citizen_id = c.citizen_id JOIN welfare_schemes ws ON b.scheme_id = ws.scheme_id JOIN citizens p ON c.parent_id = p.citizen_id WHERE ws.scheme_type = 'Vaccination' AND EXTRACT(YEAR FROM b.enrollment_date) = 2024 AND p.edu_level = '10th';";
        executeAndPrintQuery(conn, queryH, "Query H:");

        String queryI = "SELECT COUNT(*) FROM citizens c WHERE c.gender = 'Male' AND EXTRACT(YEAR FROM c.dob) = 2024;";
        executeAndPrintQuery(conn, queryI, "Query I:");

        String queryJ = "SELECT SUM(h.total_members) FROM households h WHERE h.house_no IN (SELECT DISTINCT c.house_no FROM citizens c JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id);";
        executeAndPrintQuery(conn, queryJ, "Query J:");
    }

    // method to execute the query and print the result
    private static void executeAndPrintQuery(Connection conn, String query, String label) throws SQLException {
        try (Statement stmt = conn.createStatement(); ResultSet rs = stmt.executeQuery(query)) {
            System.out.println(label);
            while (rs.next()) {
                for (int i = 1; i <= rs.getMetaData().getColumnCount(); i++) {
                    System.out.print(rs.getString(i) + "\t");
                }
                System.out.println();
            }
            System.out.print("\n");
        }
    }
}
```

Python Code :

```
import psycopg2
# python is so easy : )
# Database configuration
DB_CONFIG = {
    'dbname': 'omkar',
    'user': 'omkar',
    'password': 'tans',
    'host': 'localhost',
    'port': '5432'
}

# Queries
QUERIES = {
```

```
    "A": "SELECT c.name FROM citizens c JOIN assets a ON c.citizen_id = a.citizen_owner_id JOIN lands l
ON a.asset_id = l.asset_id WHERE l.area_in_acres > 1;",
    "B": "SELECT c.name FROM citizens c JOIN households h ON c.house_no = h.house_no WHERE c.gender =
'Female' AND (c.edu_level = '10th' OR c.edu_level = '12th') AND h.total_income < 100000;",
    "C": "SELECT SUM(l.area_in_acres) AS total_acres_rice FROM lands l WHERE l.crop_type = 'Rice';",
    "D": "SELECT COUNT(*) FROM citizens c WHERE c.dob > '2000-01-01' AND c.edu_level = '10th';",
    "E": "SELECT c.name FROM citizens c JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id JOIN
assets a ON c.citizen_id = a.citizen_owner_id JOIN lands l ON a.asset_id = l.asset_id WHERE
l.area_in_acres > 1;",
    "F": "SELECT c.name FROM citizens c WHERE c.house_no = (SELECT c.house_no FROM citizens c JOIN
panchayat_members pm ON c.citizen_id = pm.citizen_id WHERE pm.designation = 'Pradhan') AND c.citizen_id
NOT IN (SELECT pm.citizen_id FROM panchayat_members pm WHERE pm.designation = 'Pradhan');",
    "G": "SELECT SUM(a.value) AS total_value FROM assets a WHERE a.type = 'Street Light' AND a.location
= 'Phulera' AND EXTRACT(YEAR FROM a.date_of_acquisition) = 2024;",
    "H": "SELECT COUNT(DISTINCT c.citizen_id) FROM beneficiaries b JOIN citizens c ON b.citizen_id =
c.citizen_id JOIN welfare_schemes ws ON b.scheme_id = ws.scheme_id JOIN citizens p ON c.parent_id =
p.citizen_id WHERE ws.scheme_type = 'Vaccination' AND EXTRACT(YEAR FROM b.enrollment_date) = 2024 AND
p.edu_level = '10th';",
    "I": "SELECT COUNT(*) FROM citizens c WHERE c.gender = 'Male' AND EXTRACT(YEAR FROM c.dob) = 2024;",
    "J": "SELECT SUM(h.total_members) FROM households h WHERE h.house_no IN (SELECT DISTINCT c.house_no
FROM citizens c JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id);"
}

# Connect to the database and execute queries
def execute_queries():
    try:
        with psycopg2.connect(**DB_CONFIG) as conn:
            with conn.cursor() as cursor:
                for label, query in QUERIES.items():
                    print(f"Executing Query {label}:")
                    cursor.execute(query)
                    result = cursor.fetchall()
                    for row in result:
                        print(row)
                    print("\n")
    except Exception as e:
        print("Error:", e)

if __name__ == '__main__':
    execute_queries()
```

C++ Code :

```
#include <iostream>
#include <vector>
#include <cstring>
#include <sql.h>
#include <sqlext.h>
using namespace std;

void executeQueries()
{
    SQLHENV hEnv;
    SQLHDBC hDbc;
    SQLHSTMT hStmt;
    SQLRETURN ret;
```

```
   SQLAllocHandle(SQL_HANDLE_ENV, SQL_NULL_HANDLE, &hEnv);
   SQLSetEnvAttr(hEnv, SQL_ATTR_ODBC_VERSION, (void *)SQL_OV_ODBC3, 0);
   SQLAllocHandle(SQL_HANDLE_DBC, hEnv, &hDbc);

   // Update with your database connection details
                                SQLCHAR           connStr[]           =           "DRIVER={PostgreSQL
Unicode};DATABASE=omkar;SERVER=localhost;PORT=5432;UID=omkar;PWD=tans;";
   ret = SQLDriverConnect(hDbc, NULL, connStr, SQL_NTS, NULL, 0, NULL, SQL_DRIVER_COMPLETE);

   if (SQL_SUCCEEDED(ret))
   {
       // after successful connection
       cout << "Connected to the database successfully." << endl
            << "Executing queries..." << endl;

       // store the queries
       vector<string> queries = {
           // Query A
            "SELECT c.name FROM citizens c JOIN assets a ON c.citizen_id = a.citizen_owner_id JOIN lands
l ON a.asset_id = l.asset_id WHERE l.area_in_acres > 1;",
           // Query B
            "SELECT c.name FROM citizens c JOIN households h ON c.house_no = h.house_no WHERE c.gender =
'Female' AND (c.edu_level = '10th' OR c.edu_level = '12th') AND h.total_income < 100000;",
           // Query C
           "SELECT SUM(l.area_in_acres) AS total_acres_rice FROM lands l WHERE l.crop_type = 'Rice';",
           // Query D
           "SELECT COUNT(*) FROM citizens c WHERE c.dob > '2000-01-01' AND c.edu_level = '10th';",
           // Query E
              "SELECT c.name FROM citizens c JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id
JOIN assets a ON c.citizen_id = a.citizen_owner_id JOIN lands l ON a.asset_id = l.asset_id WHERE
l.area_in_acres > 1;",
           // Query F
             "SELECT c.name FROM citizens c WHERE c.house_no = (SELECT h.house_no FROM households h JOIN
citizens p ON h.house_no = p.house_no JOIN panchayat_members pm ON p.citizen_id = pm.citizen_id WHERE
pm.designation = 'Pradhan') AND c.citizen_id NOT IN (SELECT pm.citizen_id FROM panchayat_members pm
WHERE pm.designation = 'Pradhan');",
           // Query G
                "SELECT SUM(a.value) AS total_value FROM assets a WHERE a.type = 'Street Light' AND
a.location = 'Phulera' AND EXTRACT(YEAR FROM a.date_of_acquisition) = 2024;",
           // Query H
             "SELECT COUNT(DISTINCT c.citizen_id) FROM beneficiaries b JOIN citizens c ON b.citizen_id =
c.citizen_id JOIN welfare_schemes ws ON b.scheme_id = ws.scheme_id JOIN citizens p ON c.parent_id =
p.citizen_id WHERE ws.scheme_type = 'Vaccination' AND EXTRACT(YEAR FROM b.enrollment_date) = 2024 AND
p.edu_level = '10th';",
           // Query I
               "SELECT COUNT(*) FROM citizens c WHERE c.gender = 'Male' AND EXTRACT(YEAR FROM c.dob) =
2024;",
           // Query J
                "SELECT SUM(h.total_members) FROM households h WHERE h.house_no IN (SELECT DISTINCT
c.house_no FROM citizens c JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id);"};

       char x = 'A';
       for (const auto &query : queries)
       {
           // allocate statement handle for this query
```

```
            SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt);
            // execute the query
            ret = SQLExecDirect(hStmt, (SQLCHAR *)query.c_str(), SQL_NTS);

            if (SQL_SUCCEEDED(ret))
            {
                cout << "Query: " << x++ << endl;
                SQLCHAR columnData[500];
                while (SQLFetch(hStmt) == SQL_SUCCESS)
                {
                    SQLGetData(hStmt, 1, SQL_C_CHAR, columnData, sizeof(columnData), NULL);
                    cout << columnData << endl;
                }
                cout << endl;
            }
            else
            {
                printf("Error in Query %c\n", x++);
            }
            SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
        }
    }
    else
    {
        printf("Error in connection\n");
    }
    // free the resources
    SQLDisconnect(hDbc);
    SQLFreeHandle(SQL_HANDLE_DBC, hDbc);
    SQLFreeHandle(SQL_HANDLE_ENV, hEnv);
}

int main()
{
    executeQueries();
    return 0;
}
```

All the above codes are based on the following queries in SQL progarm :

```
-- A. Show names of all citizens who holds more than 1 acre of land
SELECT c.name
FROM citizens c
JOIN assets a ON c.citizen_id = a.citizen_owner_id
JOIN lands l ON a.asset_id = l.asset_id
WHERE l.area_in_acres > 1;

-- B. Show name of all girls who study in school with household income less than 1 Lakh per year
SELECT c.name
FROM citizens c
JOIN households h ON c.house_no = h.house_no
WHERE c.gender = 'Female'
 AND (c.edu_level = '10th' OR c.edu_level = '12th')
 AND h.total_income < 100000;
```

```sql
-- C. How many acres of land cultivate rice
SELECT SUM(l.area_in_acres) AS total_acres_rice
FROM lands l
WHERE l.crop_type = 'Rice';

-- D. Number of citizens who are born after 1.1.2000 and have educational qualification of 10th class
SELECT COUNT(*)
FROM citizens c
WHERE c.dob > '2000-01-01' AND c.edu_level = '10th';

-- E. Name of all employees of panchayat who also hold more than 1 acre land
SELECT c.name
FROM citizens c
JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id
JOIN assets a ON c.citizen_id = a.citizen_owner_id
JOIN lands l ON a.asset_id = l.asset_id
WHERE l.area_in_acres > 1;

-- F. Name of the household members of Panchayat Pradhan
SELECT h.total_members
FROM households h
JOIN citizens c ON c.house_no = h.house_no
JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id
WHERE pm.designation = 'Pradhan';

-- G. Total number of street light assets installed in a particular locality named Phulera that are
installed in 2024
SELECT SUM(a.value) AS total_value
FROM assets a
WHERE a.type = 'Street Light'
 AND a.location = 'Phulera'
 AND EXTRACT(YEAR FROM a.date_of_acquisition) = 2024;

-- H. Number of vaccinations done in 2024 for the children of citizens whose educational qualification
is class 10
SELECT COUNT(DISTINCT c.citizen_id)
FROM beneficiaries b
JOIN citizens c ON b.citizen_id = c.citizen_id
JOIN welfare_schemes ws ON b.scheme_id = ws.scheme_id
JOIN citizens p ON c.parent_id = p.citizen_id
WHERE ws.scheme_type = 'Vaccination'
 AND EXTRACT(YEAR FROM b.enrollment_date) = 2024
 AND p.edu_level = '10th';

-- I. Total number of births of boy child in the year 2024
SELECT COUNT(*)
FROM citizens c
WHERE c.gender = 'Male' AND EXTRACT(YEAR FROM c.dob) = 2024;

-- J. Number of citizens who belong to the household of at least one panchayat employee.
SELECT SUM(h.total_members)
FROM households h
WHERE h.house_no IN (
   SELECT DISTINCT c.house_no
   FROM citizens c
   JOIN panchayat_members pm ON c.citizen_id = pm.citizen_id);
```