Danny Argudo, Lucas Franco, Mila Manzano

Professor DeGood

CSC315

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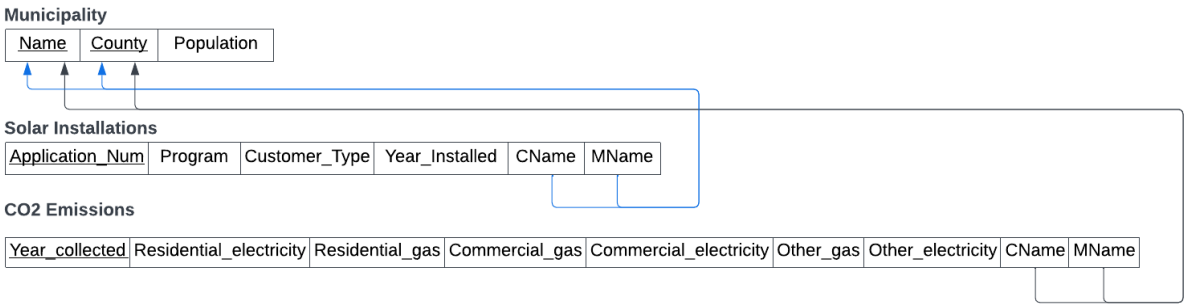

Demonstrate that all the relations in the relational schema are normalized to Boyce–Codd normal form (BCNF).

Municipality(Name, County, Population)
The primary key for this relation is (Name, County) since each municipality is uniquely identified by its name and county. There are no non-trivial functional dependencies between the attributes of this relation, so it is in BCNF.

Solar Installations(Application_Num, Program, Customer_Type, Year_Installed, CName, MName)
The primary key for this relation is Application_Num. There are functional dependencies between (CName, MName) and (Name, County) in the Municipality relation. However, since (CName, MName) is a candidate key for the Municipality relation, this relation is in BCNF.

CO2 Emissions(Year_collected, Residential_electricity, Residential_gas, Commercial_gas, Commercial_electricity, Other_gas, Other_electricity, CName, MName)
The primary key for this relation is (Year_collected, CName, MName) since we want to track CO2 emissions by year and by municipality. There are functional dependencies between (CName, MName) and (Name, County) in the Municipality relation. However, since (CName, MName) is a candidate key for the Municipality relation and appears as part of the primary key for this relation, this relation is in BCNF.

Define the different views (virtual tables) required. For each view list the data and transaction requirements. Give a few examples of queries, in English, to illustrate.

Total solar installation count per municipality up until 2015

```
CREATE VIEW install AS
SELECT MName, CName, count(*)
FROM Solar_Installations
WHERE year_installed <= ’12/31/2015’
GROUP BY MName, CName;
```

Total solar installations up until 2020

```
CREATE VIEW install AS
SELECT MName, CName, count(*)
FROM Solar_Installations
WHERE year_installed <= ’12/31/2020’
GROUP BY MName, CName;
```

Transaction Requirements:

- Ensure year is within range
- Ensure duplicate municipality names correlate to correct county

Design a complete set of SQL queries to satisfy the transaction requirements identified in the previous stages, using the relational schema and views defined in tasks 2 and 3 above.

```
BEGIN TRANSACTION;
        UPDATE install SET Customer_Type = ‘Commercial’ WHERE Application_Num =
                ‘NJSRRE1537142619’;
        UPDATE CO2_Emission SET Residential_electricity = 14,200 WHERE Year_collected =
                2015 AND CName = ‘Monmouth’ AND MName = ‘Aberdeen township’;
        UPDATE  Municipality SET Population = 8,000 WHERE Name = ‘Absecon city’ AND
                ‘Atlantic’;
END;

BEGIN TRANSACTION;
        DELETE FROM  install WHERE Application_Num = ‘NJSRRE1537142271’;
        INSERT INTO Municipality VALUES (‘Absecon city’,  ‘Atlantic’, ‘8,471’);
        UPDATE  CO2_Emission SET Commercial_electricity = 13,000  WHERE Year_collected =
                2020 AND CName = ‘Monmouth’ AND MName = ‘Aberdeen township’;
END;
```