

Top 3 Queries

1) Find which customers (along with their phone numbers and meter id) are affected by an outage scheduled for a specific day (in this case, April 16, 2025).

Reason :

This helps the municipal corporation to target those customers with advance notifications or updates, ensuring they are informed of the service disruption.

Solution :

```
SELECT
c.Customer_Name,c.Phone_Number,m.Meter_ID
FROM Customer c
NATURAL JOIN Meter m
NATURAL JOIN Water_Distribution_Station wd
NATURAL JOIN Affect_Area aa
NATURAL JOIN Outage o
WHERE DATE(o.Start_Date_Time) = '2025-04-16'
AND o.Status IN ('Scheduled', 'Active');
```

2) For each area (based on Pin Code) under a given municipal corporation, provide the total number of purification plants and reservoirs, the average water quality index (WQI) before and after purification, the average WQI improvement, the remaining reservoir capacity, and the current water level.

Reason :

This query gives a complete picture of both water quality treatment and water availability, area by area, for a given municipal corporation. It supports better decision-making.

Solution :

```
SELECT
    p.Area,p.Pin_Code,
    COUNT(DISTINCT pp.Plant_ID) AS Total_Plants,
    COUNT(DISTINCT wr.Reservoir_ID) AS Total_Reservoirs,
    AVG(pu.Before_WQI) AS Avg_Before_WQI,
    AVG(pu.After_WQI) AS Avg_After_WQI,
    AVG(pu.After_WQI-pu.Before_WQI) AS Avg_WQI_Improvement,
    SUM(wr.R_Capacity-wr.Water_Level) AS
Remaining_Reservoir_Capacity,
    SUM(wr.Water_Level) AS Current_Water_Level
FROM Pin_Code p
NATURAL JOIN Purification_Plant pp
NATURAL JOIN Water_Reservoir wr
NATURAL JOIN Purifies pu
JOIN Water_Source ws
    ON pu.Water_Source_ID = ws.Water_Source_ID
GROUP BY p.Pin_Code
HAVING p.Pin_Code IN (
    SELECT P.Pin_Code
    FROM Pin_Code P
    WHERE (P.District, P.State) IN (
        SELECT P2.District, P2.State
        FROM Pin_Code P2
        NATURAL JOIN Municipal_Corporation MC
        WHERE MC.Name = 'SMC'
    )
)
ORDER BY Avg_WQI_Improvement DESC;
```

3) Find total and average revenue, as well as total and average water consumption, for a given municipal corporation, grouped by year and pin code.

Reason :

This query is useful because it provides municipal corporation with a clear picture of water revenue and consumption trends. It breaks down the data by customer area (using the pin code) and by year, so officials can see which areas generate the most revenue and how much water is consumed. In simple terms, it helps to track financial performance and resource usage over time, which is valuable for future planning.

Solution :

```
SELECT
    c.Pin_Code AS Area_PinCode,
    EXTRACT(YEAR FROM b.Billing_Date) AS Billing_Year,
    SUM(b.Total_Price) AS Total_Revenue,
    AVG(b.Total_Price) AS Avg_Revenue,
    SUM(b.Total_Price/wr.Water_Rate) AS Total_Consumption,
    AVG(b.Total_Price/wr.Water_Rate) AS Avg_Consumption
FROM Customer c
NATURAL JOIN Meter m
NATURAL JOIN Bill b
NATURAL JOIN Water_Rate wr
JOIN Municipal_Corporation mc
ON wr.Corporation_ID=mc.Corporation_ID
WHERE mc.Name = 'SMC'
GROUP BY c.Pin_Code, EXTRACT(YEAR FROM b.Billing_Date)
ORDER BY c.Pin_Code, Billing_Year;
```

Minimal FD Set

$Customer_ID \rightarrow \{Customer_Name, Phone_Number, Billing_Cycle, Block/Flate_No, Street, Connection_Status, Feedback, Customer_Type_ID, Pin-Code\}$

$Customer_Type_ID \rightarrow \{Type_Name, Description\}$

$Bill_ID \rightarrow \{Billing_Date, Total_Price, Payment_Status, Meter_ID, Rate_ID\}$

$Meter_ID \rightarrow \{Current_Reading, Installation_Date, Status, Last_Reading_Date, Customer_ID, Station_ID\}$

$Rate_ID \rightarrow \{Customer_Type_ID, Rate_Start_Date, Rate_End_Date, Water_rate, Corporation_ID\}$

$Station_ID \rightarrow \{Water_Level, S_Capacity, Number_Of_Meters, Reservoir_ID, Pin-Code\}$

$Reservoir_ID \rightarrow \{Status, Water_Level, R_Capacity, Plant_ID, Pin-Code\}$

$Plant_ID \rightarrow \{P_Capacity, Plant_Type, Pin-Code\}$

$\{Plant_ID, Water_Source_ID\} \rightarrow \{After_WQI, Before_WQI\}$

$Water_Source_ID \rightarrow \{Type, W_Capacity, Status, Area, Corporation_ID, Pin-Code\}$

$Corporation_ID \rightarrow \{Name, Contact_Info, Pin-Code\}$

$Employee_ID \rightarrow \{Employee_Name, Role, Department, Salary, Contact_Info, Team_ID, Reservoir_ID\}$

$Outage_ID \rightarrow \{Start_Date_Time, End_Date_Time, Status, Outage_Type, Cause, Maintenance_ID\}$

$Affect_Area_ID \rightarrow \{Area_Type, Area, Outage_ID, Pin-Code\}$

$Team_ID \rightarrow \{Team_Type\}$

$Maintenance_ID \rightarrow \{Date, Start_Time, End_Time, Maintenance_Type, Status, Team_ID, Reservoir_ID\}$

$Pin_Code \rightarrow \{City, State, District, Area\}$