**Experiment No. 4**

**Aim:** Implementation of OLAP operations: Slice, Dice, Rollup, Drilldown and Pivot based on experiments.

**Theory:**

OLAP (Online Analytical Processing) operations are fundamental techniques used to interact with and analyze multidimensional data. These operations allow users to extract meaningful insights from complex data sets by aggregating, filtering, and transforming data across different dimensions. Here are the explanations of some common OLAP operations:

1. Slice:

- Definition: Slicing involves selecting a single value for a particular dimension while keeping other dimensions unchanged. It creates a new sub cube by fixing one dimension's value and looking at the data within that context.

- Use Case: For example, in a sales dataset, you could slice the data to focus only on a specific time period (e.g., a particular month) while maintaining other dimensions like products, regions, and customers.

2. Dice:

- Definition: Dicing involves selecting a subset of values from multiple dimensions to create a sub cube. This operation allows you to focus on a specific part of the data by narrowing down multiple dimensions.

- Use Case: Continuing with the sales dataset, you could dice the data to analyze sales for a specific time period and a particular region, while still considering products and customers.

3. Rollup:

- Definition: Rollup involves summarizing data across one or more dimensions. It reduces the level of granularity in data by moving from detailed data to aggregated data.

- Use Case: In a time-based dataset, you could roll up data to analyze sales quarterly instead of monthly. This operation is used to obtain higher-level insights from the data.

4. Drilldown:

- Definition: Drilldown is the opposite of rollup. It involves breaking down aggregated data into more detailed levels by adding more dimensions to the view.

- Use Case: If you have quarterly sales data, you can drill down to see the monthly data within each quarter. This operation provides a more granular view of the data.

5. Pivot:

- Definition: Pivoting involves rotating the data view to view it from a different perspective. It reorients dimensions, essentially changing rows to columns and columns to rows.

- Use Case: Consider a sales dataset with products, regions, and months. By pivoting, you can transform the data to view sales per product across different regions, making it easier to compare product performance.

These OLAP operations empower analysts and decision-makers to analyze complex datasets from various angles and levels of detail. By combining these operations, users can gain valuable insights into trends, patterns, and anomalies in multidimensional data, enabling informed decision-making and strategic planning.

**Code:**

Code for OLAP operations (Roll-Up, Drill-Down, Slice, and Dice) implemented using SQL queries on the provided restaurant data schema:

i. Slice:

select \* from mart where date\_id in(select date\_id from datetime where

extract(month from EntryDate)=9);



select \* from mart where product\_id in(select product\_id from product where

p\_type='Educational Material');



ii. Dice:

select \* from mart where location\_id in(select location\_id from location where

city\_key in(select city\_key from city where city='Mumbai' AND

state='Maharashtra'));



select \* from mart where product\_id in(select product\_id from product where

p\_type='Educational Material' AND p\_price=200);



iii. Rollup:

select SUM(tot\_amount) AS total\_amount, SUM(tot\_quantity) AS total\_quantity

from mart

join datetime on mart.date\_id = datetime.date\_id;



select EntryDate, SUM(tot\_amount) AS total\_amount, SUM(tot\_quantity) AS

total\_quantity

from mart

join datetime on mart.date\_id = datetime.date\_id

group by EntryDate;



iv. Drilldown:

select p\_type, sum(tot\_amount) AS total\_amount, sum(tot\_quantity) AS

total\_quantity

from mart

join product on mart.product\_id=product.product\_id

group by p\_type;



select p\_price, sum(tot\_amount) AS total\_amount, sum(tot\_quantity) AS

total\_quantity

from mart

join product on mart.product\_id=product.product\_id

group by p\_price;



v. Pivot:

select p\_price ,

sum(case when p\_type='Educational material' then tot\_amount else 0 end) as

P1\_Product,

sum(case when p\_type='Footwear' then tot\_amount else 0 end) as P2\_Product,

sum(case when p\_type='Backpacks' then tot\_amount else 0 end) as P3\_Product,

sum(case when p\_type='Household Material' then tot\_amount else 0 end) as

P4\_Product

from mart

join product on mart.product\_id=product.product\_id

group by p\_price;

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**Conclusion:**

Thus, OLAP operations—Slice, Dice, Rollup, Drilldown, and Pivot—provide essential techniques to analyze multidimensional data from various perspectives. These operations allow users to extract insights, identify trends, and make informed decisions by manipulating data across dimensions. By fixing, aggregating, or reorienting data, these operations offer flexibility in exploring complex datasets and enabling data-driven actions that drive business success. Ultimately, OLAP operations serve as invaluable tools for organizations seeking to maximize the value of their data assets.