DATA WAREHOUSING FINAL ASSESSMENT DOCUMENT

1. Category of a product may change over a period of time. Historical category information (current category as well as all old categories) has to be stored. Which SCD type will be suitable to implement this requirement? What kind of structure changes are required in a dimension table to implement SCD type 2 and type 3.

Answer:

A Slow Changing Dimension (SCD) is a dimension that stores and manages both current and historical data over time in a data warehouse.

The type of SCD suitable to implement the given requirement will be SCD Type-2 -Effective Date Range Mapping.

A Type-2 SCD retains the full history of values. When the value of a chosen attribute changes, the current record is closed. A new record is create with the changed values and this new record becomes the current record. Each record contains the effective time and expiration time to identify the time period between which the record was active.

Using SCD 2, one can easily save unlimited history with the help of surrogate key. In this structure, the table will never be

effected(constant), only the no of rows will be effected(increased) and to prevent the duplication of data, primary key will be used.

Original Table:

PRODUCT_ID	PRODUCT	CATEGORY
1	Lays	Chips
2	Amul Milk	Dairy

SCD Type 2:

STATUS ID	PRODUCT_ID	PRODUCT	CATEGORY	ST_DATE	ED_DATE
100	1	Lays	Chips	01-01-2019	15-06-2019
101	2	Amul Milk	Dairy	01-01-2019	
102	3	Lays	Snacks	16-06-2019	

The structure changes happens in dimension table to implement SCD Type-2 and SCD Type-3 are:

ORIGINAL TABLE:

PRODUCT_ID	PRODUCT	CATEGORY
1	Lays	Chips
2	Amul Milk	Dairy

SCD TYPE-2:

STATUS ID	PRODUCT_ID	PRODUCT	CATEGORY	ST_DATE	ED_DATE
100	1	Lays	Chips	01-01-2019	15-06-2019
101	2	Amul Milk	Dairy	01-01-2019	
102	3	Lays	Snacks	16-06-2019	

SCD2 allows you to insert new records and changed records using two new columns (ST_DATE and ED_DATE) by maintaining the date range in the table to track the changes. It uses a n column primary key(STATUS_ID) to maintain the history.

SCD TYPE-3:

PRODUCT_ID	PRODUCT	PREVIOUS CATEGORY	CURRENT CATEGORY
1	Lays	Chips	Snacks
2	Amul Milk	Dairy	

SCD3 keeps current as well as historical data in the table. It maintains only partial history by adding a new column PREVIOUS_CATEGORY(previous column name). It does not maintain full history.

2. What is surrogate key? Why it is required?

Answer:

A surrogate key is a system generated value with no business meaning that is used to uniquely identify a record in a table. The key itself could be made up of one or multiple columns.

A surrogate key like a natural key (primary key) is a column that uniquely identifies a single record in a table. But this is where the similarity stops. Surrogate keys are like surrogate mothers. They are keys that don't have a natural relationship with rest of the table. The surrogate key is just a value that is generated and then stored with the rest of the columns in a record. The key value is

typically generated at run time right before the record is inserted into a table. It is sometimes also referred to as a dumb key, because there is no meaning associated with the value. Surrogate keys are commonly a numeric number.

Surrogate Key Pros:

- N business logic in key so no changes based on business requirements.
- Less code if maintaining same key strategy across all entities.
- Better performance since key value is smaller. Less disk IO is required on, when accessing single column indexes.
- Surrogate key is guaranteed to be unique.
- If a sequence used then there is little index maintenance required since the value is ever increasing which leads to less index fragmentation.

Surrogate Keys are allowed when:

I. No property has the parameter of primary key
II. In the table, primary key is too big or complicated

For example, a table EmployeeContract may hold temporal information to keep track of contracted working hours. The

business key for one contract will be identical (non-unique) in both rows however the surrogate key for each row is unique.

Surrogate key	Business key	Employee Name	Working Hours Per Week	Row Valid From	Row Valid To
1	A1019	Bob	50	01-01-2019	15-06-2019
57	A4456	John	46	01-01-2019	23-07-2019
345	A1019	Bob	35	16-06-2019	29-11-2019

3. What is a semi-additive measure? Give an example.

Answer:

Semi Additive measures are values that you can summarize across any related dimension except time. These are those specific class of fact measures which can be aggregated across all dimension and their hierarchy except the time dimension.

For example:

Sales and costs are fully additive. If you sell 100 yesterday and 50 today then you've sold 150 in total. You can add them up over time.

Stock levels however are semi additive. If you had 100 in stock yesterday, and 50 in stock today, you're total stock is 50, not 150. It doesn't make sense to add up the measures over time, you need to find the most recent value.

4. Stores are grouped in to multiple clusters. A store can be part of one or more clusters. Design tables to store this store-cluster mapping information.

Answer:

STORE

STORE_ID	STORE_NAME	CLUSTER_ID
101	A	CL-01
102	B	CL-02
103	C	CL-02

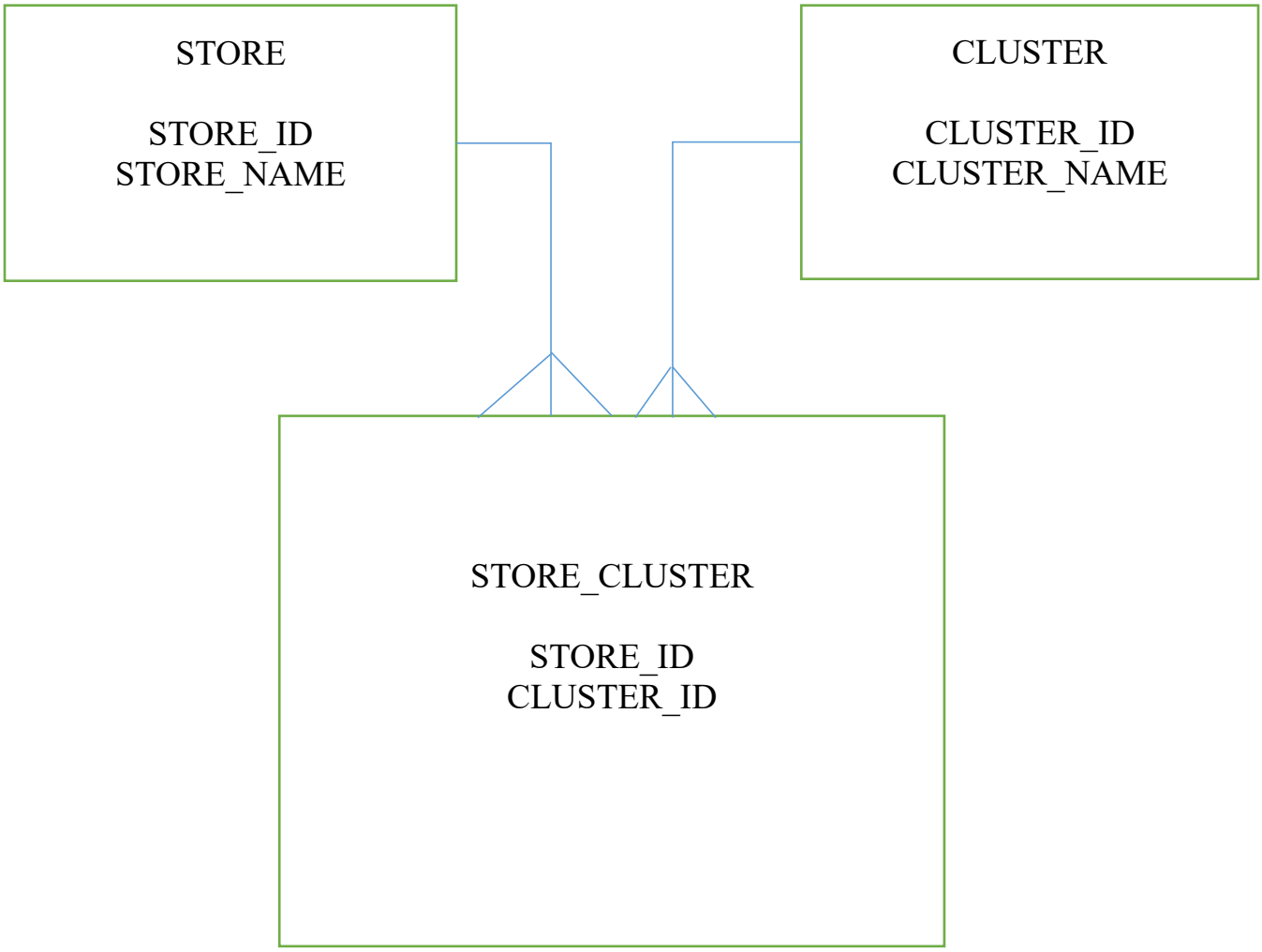
CLUSTER

CLUSTER_ID	CLUSTER_NAME
CL-01	1
CL-02	2
CL-03	3

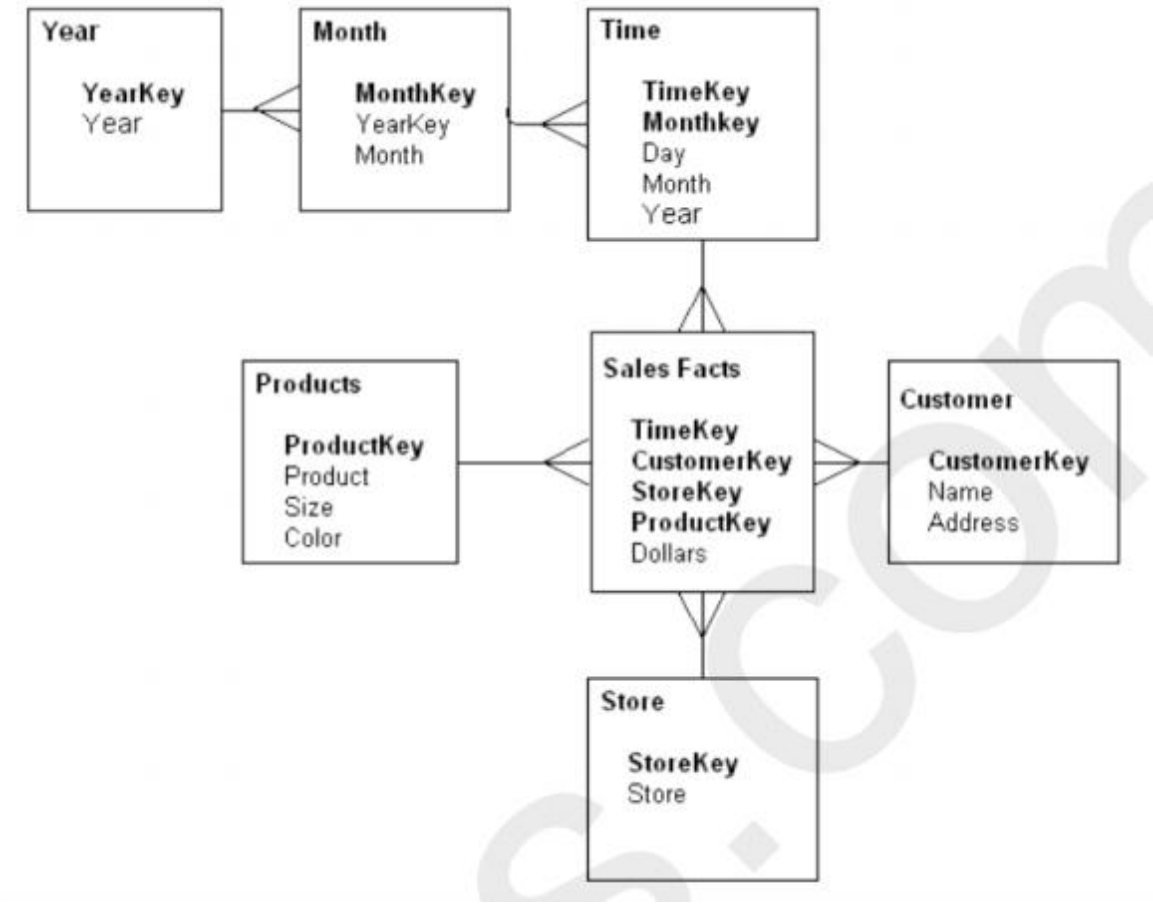
STORE_CLUSTER TABLE

STORE_ID	STORE_NAME	CLUSTER_ID	CLUSTER_NAME
101	A	CL-01	1
102	B	CL-01	1
102	B	CL-02	2
103	C	CL-03	3

STAR SCHEMA FOR STORE_CLUSTER MAPPING



5. For the given Dimensional Modelling, please identify the following:



- How many dimensions and Facts are present?

FACT TABLES: 1; Sales Facts
DIMENSION TABLES: 6;

De-Normalised Dimension: 4; Time, Customer, Products, Store
Normalised Dimension:2; YearKey, MonthKey

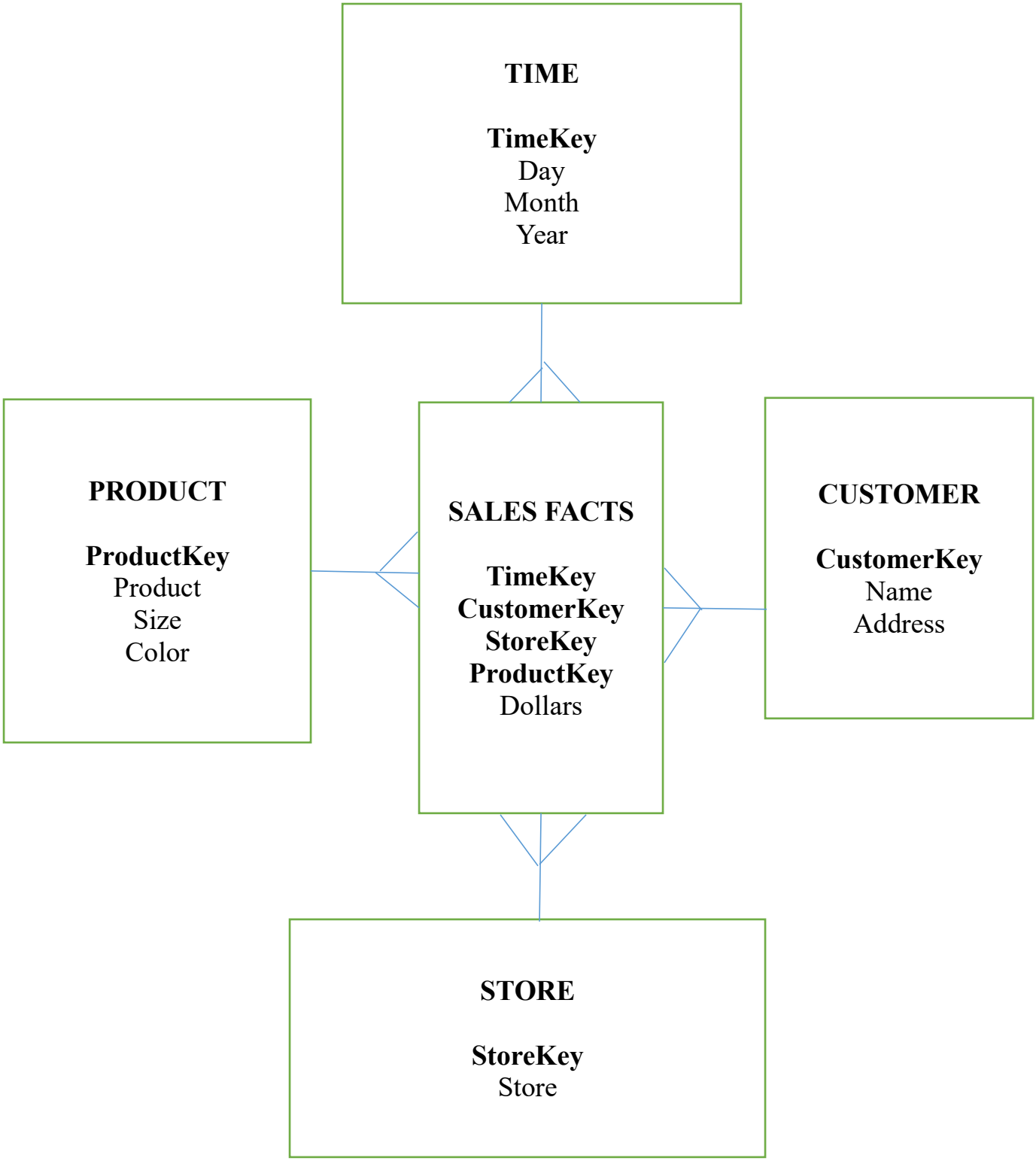
- Please identify the cardinality between each table?

  YEAR ----(One-to-Many)----> MONTH
  MONTH ----(One-to-Many)----> TIME
  TIME ----(One-to-Many)----> SALES FACTS
  PRODUCT ----(One-to-Many)----> SALES FACTS
  STORE ----(One-to-Many)----> SALES FACTS
  CUSTOMER ----(One-to-Many)----> SALES FACTS

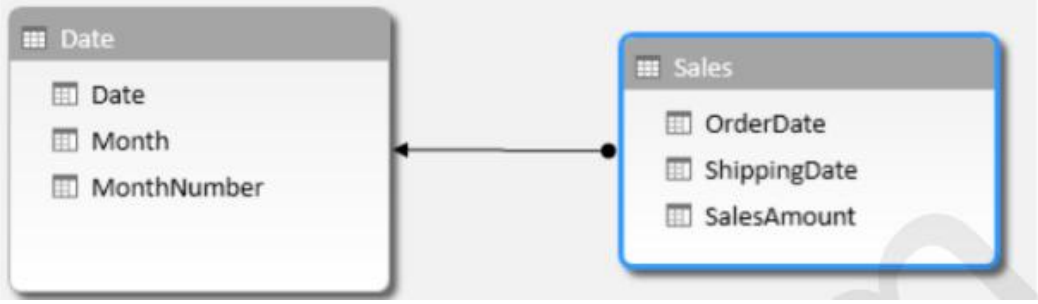
- How to create a Sales_Aggr fact using the following structure (SQL Statement):


```
Create table Sales_Aggr As
                    (Year_ID INT(4) PRIMARY KEY,
                    Customer_key INT(10) PRIMARY KEY,
                    Store_Key INT(10) PRIMARY KEY,
                    Product_key INT(20) PRIMARY KEY,
                    Dollars DOUBLE,
                    FOREIGN KEY (Year_ID) REFERENCES
                    Year(YearKey),
                    FOREIGN KEY (Customer_key)
                    REFERENCES Customer(CustomerKey),
                    FOREIGN KEY (Store_Key) REFERENCES
                    Store(Store_Key),
                    FOREIGN KEY (Product_Key)
                    REFERENCES Product(ProductKey));
```

- Can you Please Modify the above snowflake schema to Star schema and draw the dimension model, showing all the cardinality?



6. For the following dimension Model can you please give an example of Circular Join and how to avoid it:



Answer:

Circular Join:

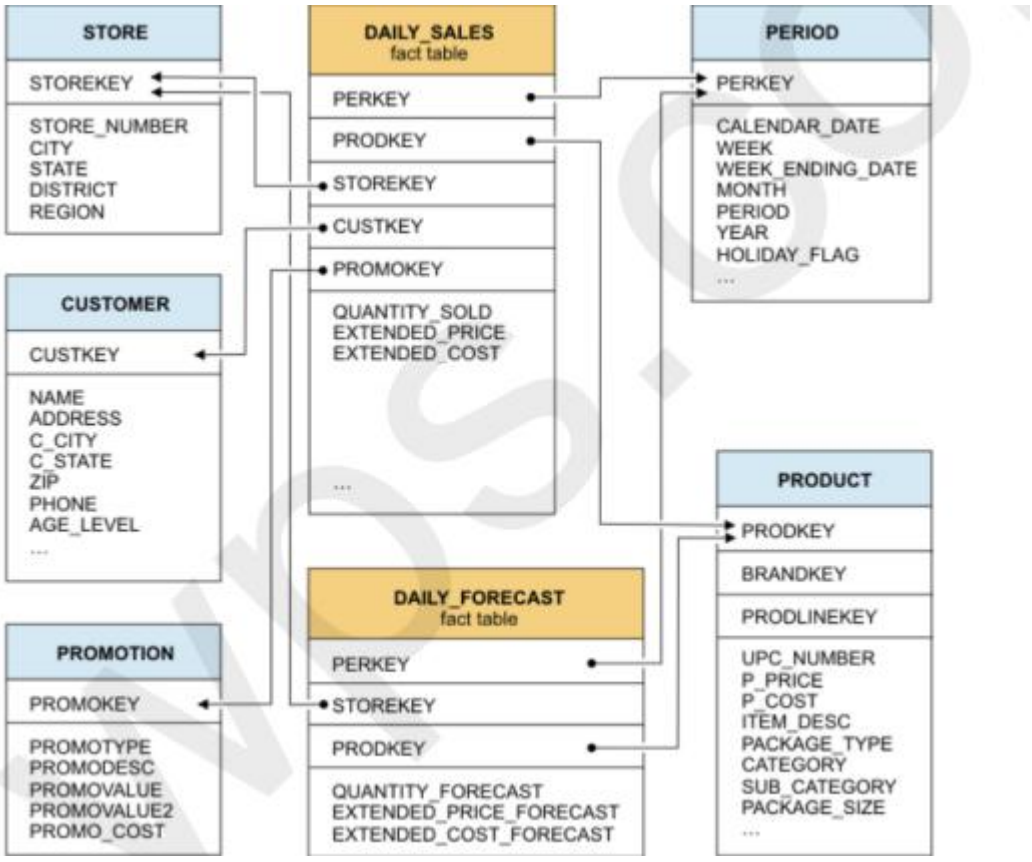
Select max(SalesAmount) from Sales, Date
Where Sales.OrderDate = Date.Date,
Sales.ShippingDate = Date.Date;

Circular Joins or loops occur when say a table A is joined to table B and in turn joined to table A. Hence the loops should be generally avoided.

To avoid circular join, we can make use of alias name.

Select max(SalesAmount) from Sales s, Date d1, Date d2
Where s.OrderDate = d1.Date,
s.ShippingDate = d2.Date;

7. For the given Dimension Model, can you please generate a sql to get the total divergence between Quantity sold and Quantity Forecast for the current month for all the stores:



Answer:

```
Select ((select sum(QUANTITY_SOLD) from DAILY_SALES, PERIOD
        where PERIOD.MONTH = tochar(sysdate,'MM'))
    - (select sum(QUANTITY_FORECAST) from
DAILY_FORECAST, PERIOD
        where PERIOD.MONTH = tochar(sysdate, 'MM'));
```

8.For the above-mentioned dimension model, please identify the conformed and non-conformed dimensions. Additionally, identify the measure types?

Answer:

Conformed Dimensions: STORE, PERIOD, PRODUCT
Non-Conformed Dimensions: CUSTOMER, PROMOTION

Measures: Additive type: QUANTITY_SOLD, QUANTITY_FORECAST
Semi-Additive: EXTENDED_PRICE, EXTENDED_COST
Non-Additive: EXTENDED_PRICE_FORECAST
EXTENDED_COST_FORECAST

9.Make a list of differences between DW and OLTP based on Size, Usage, Processing and Data Models.

Answer:

	DATA WAREHOUSE	OLTP
Size	The size of DW is more than terabytes of data	The size of OLTP ranges from few gigabytes to hundreds gigabytes
Usage	Type of database used for analytical processing	Collection of objects used for data retrieval, modification, and data access.
Processing	Analytical processing may require several minutes to run.	Databases which are OTLP require sub-second response time.
Data Models	Data warehouse follows star and snow flake schema model for designing the database.	The database follows the entity-relationship(ER) database, model