Birla Institute of Technology and Science, Pilani.
CS F212 Database Systems
Lab No #2

In the last lab, we learnt about writing simple SQL Queries. A quick recap:

- Creating tables and inserting records
- Adding constraints while creation of tables - column and table constraints
- The concepts of Primary and Foreign Keys.
- Deleting and Altering tables

Objectives of Lab 2

- Learning comprehensively about commands like INSERT, UPDATE, DELETE. These are required to update the table rows or "tuples".
- Learning and implementing retrieval commands in details, like SELECT, with conditional selection mechanism through WHERE, AND, HAVING and GROUP BY clause
- Supplementary material and the end of the labsheet will throw light on some advance selection using conditional CASE and some other commands.

Some other generic tips for a kickstart in SQL are:

Think of SQL like general english sentences with some specific keywords. It becomes really intuitive and easy to learn that way. For example, if I tell you to update all the entries so as to make the entries have email "xxx", wherever (only if) their id currently is "yyy". Ask yourself the following questions:

- What do I have to do? - UPDATE
- Which table? - STUDENTS
- How to UPDATE? - SET the email as "xxx"
- Whom to update? - WHERE id is "yyy"

FINAL ANSWER: **UPDATE STUDENTS SET EMAIL='XXX' WHERE ID='YYY'**

Data Manipulation Language(DML)

In today's lab, DML part of SQL will be discussed.

1. Modifying Data: (DML)

SQL provides three statements for modifying data: INSERT, UPDATE, and DELETE.

a. INSERT

The INSERT statement adds new rows to a specified table. There are two variants of the INSERT statement. One inserts a single row of values into the database, whereas the other inserts multiple rows returned from a SELECT.

The most basic form of INSERT creates a single, new row with either user-specified or default values. This is covered in the previous lab.

The INSERT statement allows you to create new rows from existing data. It begins just like the INSERT statements we've already seen; however, instead of a VALUES list, the data are generated by a nested SELECT statement. The syntax is as follows:

```
INSERT INTO <table name>
[(<attribute>, : : :, <attribute>)]
<SELECT statement>;
```

SQL then attempts to insert a new row in *<table name>* for each row in the SELECT result table. The attribute list of the SELECT result table must match the attribute list of the INSERT statement. For example -

```
CREATE TABLE CUSTOMER(
CUSTOMER_ID VARCHAR(20) PRIMARY KEY,
CUSTOMER_NAME CHAR(50)
);

CREATE TABLE CUSTOMERS_COPY(
      CUSTOMER_ID VARCHAR(20) PRIMARY KEY,
      CUSTOMER_NAME CHAR(50)
   );


//INSERTING NEW VALUES
INSERT INTO CUSTOMER VALUES('FAMLOV3388','ARYAN');
INSERT INTO CUSTOMER VALUES('NDS-98','NAMAN');

//INSERTING PRE-EXISTING VALUES FROM OTHER TABLES
INSERT INTO CUSTOMERS_COPY(CUSTOMER_ID, CUSTOMER_NAME) SELECT * FROM
      CUSTOMER;
```

b. UPDATE

You can change the values in existing rows using UPDATE.

```
UPDATE <table-name> [[AS] <alias>]
SET <column>=<expression>, : : :, <attribute>=<expression>
[WHERE <condition>];
```

UPDATE changes all rows in *<table name>* where *<condition>* evaluates to true. For each row, the SET clause dictates which attributes change and how to compute the new value. All other attribute values do not change. The WHERE is optional, but beware! If there is no WHERE clause, UPDATE changes *all* rows. UPDATE can only change rows from a single table.

```
CREATE TABLE STUDENTS (
IDNO CHAR(50),
NAME VARCHAR(100),
EMAIL VARCHAR(100),
CGPA NUMERIC(4,2));

UPDATE STUDENTS SET NAME='TEST', EMAIL='test@yahoo.com' WHERE
IDNO='2000A7PS001';

UPDATE STUDENTS SET EMAIL='f20170011@pilani.bits-pilani.ac.in' WHERE IDNO=
'2000A7PS001';

UPDATE STUDENTS SET CGPA=10;
```

c. DELETE

You can remove rows from a table using DELETE.

DELETE FROM *<table name>* [[**AS**] ***<alias>***]
[**WHERE *<condition>***];

DELETE removes all rows from *<table name>* where *<condition>* evaluates to true. The WHERE is optional, but beware! If there is no WHERE clause, DELETE removes *all* rows. DELETE can only remove rows from a single table.

```
      DELETE FROM STUDENTS WHERE IDNO='2000A7PS001'; -- (DELETE RECORDS
WHERE IDNO = '2001A7PS001')

      DELETE FROM STUDENTS; -- (DELETES ALL THE RECORDS FROM THE STUDENT
TABLE)

      TRUNCATE TABLE STUDENT; --(see what it does to your table)
```

TRUNCATE removes all rows but it can't be rolled back (undone). TRUNCATE is faster than DELETE. TRUNCATE is DDL statement and DELETE is a DML statement.

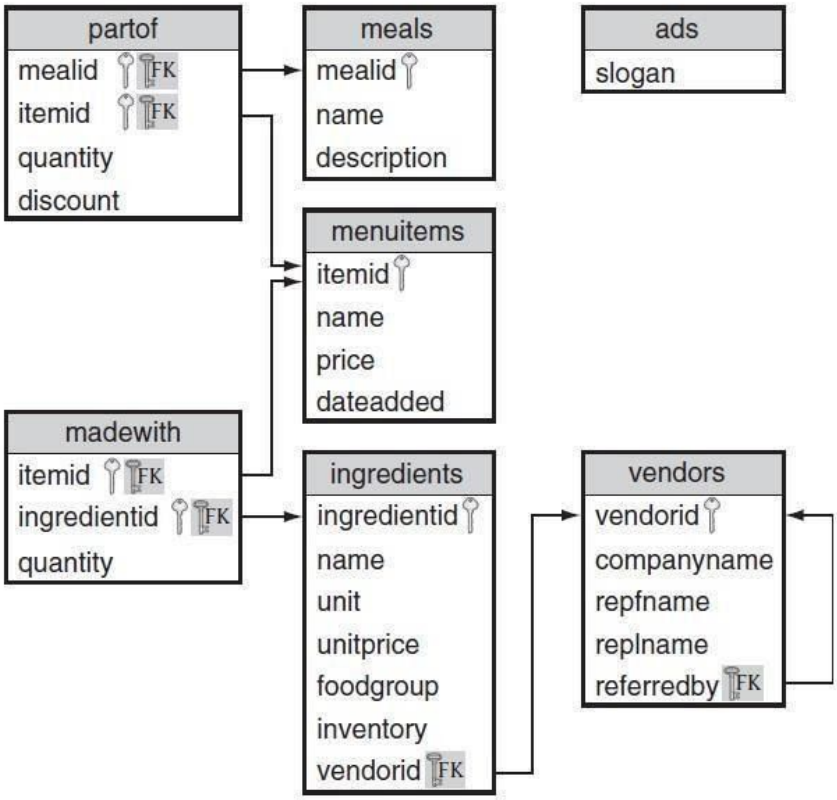
2. Data Retrieval

For retrieval, SELECT, WHERE, FROM, GROUP BY, HAVING clauses are used extensively. We will practice some SQL queries on a schema of a restaurant chain. The schema has eight tables and one view.

For Running the Script in Microsoft SQL Server

- **In** Microsoft SQL Server Management Studio**, on the menu, select** File **>** Open **>** File**.**
- **In the** Open File **dialog box, browse for the script file, and then click** OK**.**
- On the SQL Editor toolbar, select the appropriate database, and then click **Execute** to run the script.

Download the script 'restaurant.sql'. The table schema is given below:



Identify the referential integrity constraints from the schema. **SELECT, FROM, WHERE clauses:**

- The SELECT clause is used to select data from a database. The SELECT clause is a query expression that begins with the SELECT keyword and includes a number of elements that form the expression. WHERE clause is used to specify the Search Conditions. The operators commonly used for comparison are =, > , < , >=, <= , <>.

Create a value menu of all items costing $0.99 or less.

```
SELECT name
       FROM items
       WHERE PRICE <= 0.99;
```

The following operators are also used in WHERE clause.

BETWEEN	Between two values(inclusive)	Vendorid BETWEEN 2 AND 10

IS NULL	Value is Null	Referredby IS NULL
LIKE	Equal String using wild cards(e.g. '%','_')	Name LIKE 'pri%'
IN	Equal to any element in list	Name IN ('soda',' water')
NOT	Negates a condition	NOT item IN ('GDNSD','CHKSD')

Find all items with a name less than or equal to 'garden'

```
SELECT name
FROM items
WHERE name <= 'garden';
```

Find the list of vendor representative first names that begin with 's'

```
SELECT repfname
FROM vendors
WHERE repfname LIKE 's%';
```

Find all vendor names containing an '_'.

```
SELECT companyname
FROM vendors
WHERE companyname LIKE '%#_%' ESCAPE '#';
```

❖ **Note: Here '_' is special wildcard character. To escape it '#' (or any character) is used.**

```
SELECT companyname
FROM vendors
WHERE companyname LIKE '%\_%' ESCAPE '\';
```

❖ **Note: To escape ' we need to use one more ' before it**

```
SELECT companyname
FROM vendors
WHERE companyname LIKE '%''' ;
```

Using Logical operators-AND, OR, NOT

Find the name of all of the food items other than salads.

```
SELECT name
FROM items
WHERE NOT name LIKE '%Salad';
```

Find all of the ingredients from the fruit food group with an inventory greater than 100

```
SELECT ingredientid,name
FROM ingredients
```

```
WHERE foodgroup = 'Fruit' AND inventory >100;
```

Find the food items that have a name beginning with either F or S that cost less than $3.50

```
SELECT NAME, PRICE FROM ITEMS WHERE NAME LIKE 'F%' OR NAME LIKE 'S%' AND
PRICE < 3.50
```

❖ See the result of the above query. Is it correct? Why did it happen? Modify the query to get the correct result.

NOTE: The precedence order is NOT, AND, OR from highest to lowest.

BETWEEN (inclusive)

Find the food items costing between $2.50 and $3.50.

```
SELECT *
FROM items
WHERE price BETWEEN 2.50 AND 3.50;
```

Selecting a set of values using IN, NOT IN

Find the ingredient ID, name, and unit of items not sold in pieces or strips.

```
SELECT ingredientid,name,unit
FROM ingredients
WHERE unit NOT IN ('piece','stripe');
```

IS NULL

SQL interprets NULL as unknown. So comparing any value with NULL returns unknown result. *Find the details of all vendors not referred by anyone.*

```
SELECT *
FROM vendors
WHERE referredby = NULL;
```

Check the output and try the following.

```
SELECT *
FROM vendors
WHERE referredby IS NULL;
```

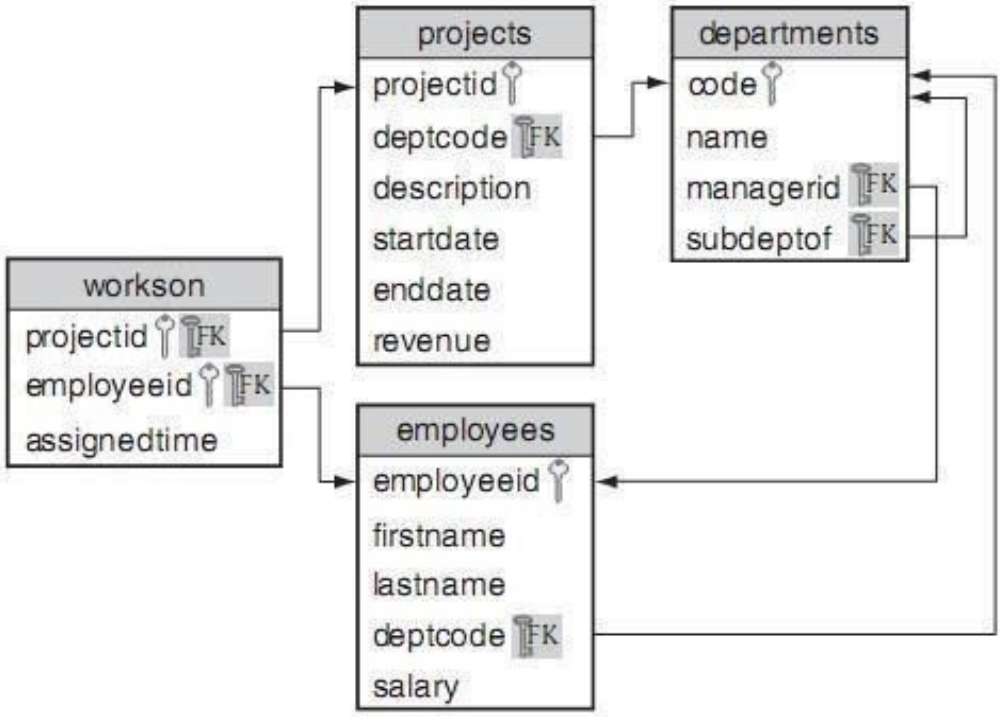
Do you see the difference? Comparing NULL with any attribute gives an unknown result.

We now move on to solving some real life situation problems in the form of an exercise on the next page:

EXERCISE 1

Write a single SQL query for each of the following based on "employees" database. If you have not created the employee database in the last lab, you can create and insert data using the following employee_new.sql file.

The schema for the employee database is as shown below.



1. List the first and last names of all employees.
2. List all attributes of the projects with revenue greater than $40,000.
3. List the department codes of the projects with revenue between $100,000 and $150,000.
4. List the project IDs for the projects that started on or before July 1, 2004.
5. List the names of the departments that are top level (i.e., not a sub department).
6. List the ID and descriptions of the projects under the departments with code ACCNT, CNSLT, or HDWRE.
7. List all of the information about employees with last names that have exactly 8 characters and end in 'ware'.
8. List the ID and last name of all employees who work for department ACTNG and make less than $30,000.
9. List the "magical" projects that have not started (indicated by a start date in the future or *NULL)* but are generating revenue.
10. List the IDs of the projects either from the ACTNG department or that are ongoing (i.e., *NULL* end date). Exclude any projects that have revenue of $50,000 or less.

The next page talks about some very important concepts in selection, ordering and display that will be tested in supplementary material.

Other Important concepts:

Reshaping Results

- As we know that every query result is a relation. SQL allows us to specify how this relation should be shown in a desired way. The resulting relation columns can be renamed, duplicates can be eliminated, derived attributes can be added, the rows can be sorted by some criteria etc.

- Result table columns have the same name as attributes in the original table; however, you can change the result table column using a column alias using 'AS'

```
SELECT COMPANYNAME AS "COMPANY", REPFNAME AS "FIRST NAME" FROM VENDORS;
```

- DISTINCT keyword when used in SELECT clause removes the duplicates. It can be used only once in the SELECT clause. It treats NULL as a distinct value.

Find the distinct list of food groups provided by each vendor

```
SELECT DISTINCT FOODGROUP, VENDORID FROM INGREDIENTS;
```

- ALL is used to specify that the result table should include duplicates also. Since by default duplicate elimination is not done, it is unnecessary.
- Data in the original table can be somewhat raw. SQL provides the ability to create derived attributes in our result table that are derived using operations and functions over existing attributes and literals.

- It is also possible to concatenate two or more columns in original table as one single column in result table.

Create a mailing label for each store

```
SELECT manager, CONVERT(VARCHAR(10),GETDATE(),105) as "As on", address+' '+city+'
'+state+'  '+zip+ 'USA' as "mail" from stores;
```

- Note that system date can be printed using the function sysdatetime().

ORDER BY: The ORDER BY keyword is used to sort the result-set by a specified column in ASCending or DESCending order.

- The ORDER BY clause takes the output from the SELECT clause and orders the query results according to the specifications within the ORDER BY clause
- The ORDER BY keyword sort the records in ascending order by default.

Find all items from most to least expensive

```
SELECT name,price
FROM items
ORDER BY price ASC;
```

Find the name and inventory value of all ingredients ordered by inventory value

```
SELECT name,inventory*unitprice AS value
FROM ingredients
ORDER BY value DESC;
```