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SVCE BENGALURU

SRI VENKATESHWARA COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE &

ENGINEERINGBE - V SEMESTER

DBMS LABORATORY WITH MINI PROJECT MANUAL -18CSL58

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CHAPTER – 1

BASIC CONCEPTS OF SQL

Introduction to SQL

SQL stands for “Structured Query Language” and can be pronounced as “SQL” or “sequel – (Structured English Query Language)”. It is a query language used for accessing and modifying information in the database. IBM first developed SQL in 1970s. Also it is an ANSI/ISO standard. It has become a Standard Universal Language used by most of the relational database management systems (RDBMS). Some of the RDBMS systems are: Oracle, Microsoft SQL server, Sybase etc. Most of these have provided their own implementation thus enhancing its feature and making it a powerful tool. Few of the SQL commands used in SQL programming are SELECT Statement, UPDATE Statement, INSERT INTO Statement, DELETE Statement, WHERE Clause, ORDER BY Clause, GROUP BY Clause, ORDER Clause, Joins, Views, GROUP Functions, Indexes etc.

SQL Commands

SQL commands are instructions used to communicate with the database to perform specific task that work with data. SQL commands can be used not only for searching the database but also to perform various other functions like, for example, you can create tables, add data to tables, or modify data, drop the table, set permissions for users. SQL commands are grouped into four major categories depending on their functionality:

- **Data Definition Language (DDL)** - These SQL commands are used for creating, modifying, and dropping the structure of database objects. The commands are CREATE, ALTER, DROP, RENAME, and TRUNCATE.
- **Data Manipulation Language (DML)** - These SQL commands are used for storing, retrieving, modifying and deleting data. These commands are SELECT, INSERT, UPDATE, and DELETE.
- **Transaction Control Language (TCL)** - These SQL commands are used for managing changes affecting the data. These commands are COMMIT, ROLLBACK, and SAVEPOINT.

- **Data Control Language (DCL)** - These SQL commands are used for providing security to database objects. These commands are GRANT and REVOKE.

Data Definition Language (DDL)

CREATE TABLE Statement

The CREATE TABLE Statement is used to create tables to store data. Integrity Constraints like primary key, unique key and foreign key can be defined for the columns while creating the table. The integrity constraints can be defined at column level or table level. The implementation and the syntax of the CREATE Statements differs for different RDBMS.

The Syntax for the CREATE TABLE Statement is:

```
CREATE TABLE table_name
(column_name1 datatype constraint,
column_name2    datatype, ...
column_nameNdatatype);
```

- ***table_name*** - is the name of the table.
- ***column_name1, column_name2....*** - is the name of the columns
- ***datatype*** - is the datatype for the column like char, date, number etc.

SQL Data Types:

char(size)	Fixed-length character string. Size is specified in parenthesis. Max 255 bytes.
Varchar2(size)	Variable-length character string. Max size is specified in parenthesis.
number(size)or int	Number value with a max number of column digits specified in parenthesis.
Date	Date value in ‘dd-mon-yy’. Eg., ’07-jul-2004’
number(size,d)or real	Number value with a maximum number of digits of "size" total, with a maximum number of "d" digits to the right of the decimal.

SQL Integrity Constraints:

Integrity Constraints are used to apply business rules for the database tables.The constraints available in SQL are **Foreign Key, Primary key, Not Null, Unique, Check.** Constraints can be defined in two ways:

1. The constraints can be specified immediately after the column definition. This is called column-level definition.
2. The constraints can be specified after all the columns are defined. This is called table-level definition.

1) Primary key:

This constraint defines a column or combination of columns which uniquely identifies each row in the table.

Syntax to define a Primary key at column level:

```
Column_namedatatype [CONSTRAINT constraint_name] PRIMARY KEY
```

Syntax to define a Primary key at table level:

```
[CONSTRAINT      constraint_name]      PRIMARY      KEY(column_name1,
column_name2,..)
```

- **column_name1, column_name2** are the names of the columns which define the primary key.
- The syntax within the bracket i.e. [CONSTRAINT constraint_name] is optional.

2) Foreign key or Referential Integrity:

This constraint identifies any column referencing the PRIMARY KEY in another table. It establishes a relationship between two columns in the same table or between different tables. For a column to be defined as a Foreign Key, it should be a defined as a Primary Key in the table which it is referring. One or more columns can be defined as Foreign key.

Syntax to define a Foreign key at column level:

```
[CONSTRAINT constraint_name] REFERENCES
```

```
referenced_table_name(column_name)
```

Syntax to define a Foreign key at table level:

```
[CONSTRAINT  constraint_name]  FOREIGN  KEY(column_name)  REFERENCES
```

```
referenced_table_name(column_name);
```

3) Not Null Constraint:

This constraint ensures all rows in the table contain a definite value for the column which is specified as not null. Which means a null value is not allowed.

Syntax to define a Not Null constraint:

```
[CONSTRAINT constraint name] NOT NULL
```

4) Unique Key:

This constraint ensures that a column or a group of columns in each row have a distinct value. A column(s) can have a null value but the values cannot be duplicated.

Syntax to define a Unique key at column level:

```
[CONSTRAINT constraint_name] UNIQUE
```

Syntax to define a Unique key at table level:

```
[CONSTRAINT constraint_name] UNIQUE(column_name)
```

5) Check Constraint:

This constraint defines a business rule on a column. All the rows must satisfy this rule. The constraint can be applied for a single column or a group of columns.

Syntax to define a Check constraint:

```
[CONSTRAINT constraint_name] CHECK (condition)
```

ALTER TABLE Statement

The SQL ALTER TABLE command is used to modify the definition structure) of a table by modifying the definition of its columns. The ALTER command is used to perform the following functions.

1) Add, drop, modify table columns
2) Add and drop constraints
3) Enable and Disable constraints

Syntax to add a column

```
ALTER TABLE table_name ADD column_namedatatype;
```

For Example: To add a column "experience" to the employee table, the query would be like

```
ALTER TABLE employee ADD experience number(3);
```

Syntax to drop a column

```
ALTER TABLE table_name DROP column_name;
```

For Example: To drop the column "location" from the employee table, the query would be like

```
ALTER TABLE employee DROP location;
```

Syntax to modify a column

```
ALTER TABLE table_name MODIFY column_namedatatype;
```

For Example: To modify the column salary in the employee table, the query would be like

```
ALTER TABLE employee MODIFY salary number(15,2);
```

Syntax to add PRIMARY KEY constraint

```
ALTER  TABLE  table_nameADD  CONSTRAINT  constraint_name  PRIMARY  KEY
column_name;
```

Syntax to drop PRIMARY KEY constraint

```
ALTER TABLE table_nameDROP PRIMARY KEY;
```

The DROP TABLE Statement

The DROP TABLE statement is used to delete a table.

```
DROP TABLE table_name;
```

TRUNCATE TABLE Statement

What if we only want to delete the data inside the table, and not the table itself?

Then, use the TRUNCATE TABLE statement:

```
TRUNCATE TABLE table_name;
```

Data Manipulation Language (DML):

The SELECT Statement

The SELECT statement is used to select data from a database.The result is stored in a result table, called the result-set.

SELECT Syntax:

```
SELECT * FROM table_name;
```

The SELECT DISTINCT Statement

In a table, some of the columns may contain duplicate values. This is not a problem, however, sometimes you will want to list only the different (distinct) values in a table.The DISTINCT keyword can be used to return only distinct (different) values.

SELECT DISTINCT Syntax:

```
SELECT DISTINCT column_name(s)
FROM table_name;
```

The WHERE Clause

The WHERE clause is used to extract only those records that fulfill a specified criterion.

WHERE Syntax:

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator value;
```

The AND & OR Operators

- The AND operator displays a record if both the first condition and the second condition is true.
- The OR operator displays a record if either the first condition or the second condition is true.

The ORDER BY Clause

- The ORDER BY clause is used to sort the result-set by a specified column.
- The ORDER BY clausesort the records in ascending order by default.
- If you want to sort the records in a descending order, you can use the DESC keyword.

ORDER BY Syntax:

```
SELECT column_name(s)
FROM table_name
ORDER BY column_name(s) ASC|DESC;
```

The GROUP BY Clause

The GROUP BY clause can be used to create groups of rows in a table. Group functions can be applied on such groups.

GROUP BY Syntax;

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator value
GROUP BY  column_name(s);
```

Group functions	Meaning
AVG([DISTINCT|ALL],N])	Returns average value of n
COUNT(*|[DISTINCT|ALL]expr)	Returns the number of rows in the query. When you specify expr, this function considers rows where expr is not null. When you specify the asterisk (*), this function Returns all rows, including duplicates and nulls. You can count either all rows, or only distinct

	values of expr.
MAX([DISTINCT|ALL]expr)	Returns maximum value of expr
MIN([DISTINCT|ALL]expr)	Returns minimum value of expr
SUM([DISTINCT|ALL]n)	Returns sum of values of n

The HAVING clause

The HAVING clause can be used to restrict the display of grouped rows. The result of the grouped query is passed on to the HAVING clause for output filtration.

HAVING Syntax;

```
SELECT column_name(s)
FROM table_name
WHERE column_name operator value
GROUP BY column_name(s)
HAVING condition;
```

The INSERT INTO Statement

The INSERT INTO statement is used to insert a new row in a table.

SQL INSERT INTO Syntax:

It is possible to write the INSERT INTO statement in two forms.

- The first form doesn't specify the column names where the data will be inserted, only their values:

```
INSERT INTO table_nameVALUES (value1, value2, value3,...);
```

OR

```
INSERT INTO table_nameVALUES(&column1, &column2, &column3,...);
```

- The second form specifies both the column names and the values to be inserted:

```
INSERT INTO table_name (column1, column2, column3,...)
VALUES (value1, value2, value3,...);
```

The UPDATE Statement

The UPDATE statement is used to update existing records in a table.

SQL UPDATE Syntax:

```
UPDATE table_name
SET column1=value, column2=value2,...
WHERE some_column=some_value;
```

The DELETE Statement

The DELETE statement is used to delete rows in a table.

SQL DELETE Syntax:

```
DELETE FROM table_name
WHERE some_column=some_value;
```

Transaction Control language

Transaction Control Language (TCL) commands are used to manage transactions in database.These are used to manage the changes made by DML statements. It also allows statements to be grouped together into logical transactions

Commit command

Commit command is used to permanently save any transaaction into database.

Following is Commit command's syntax,

commit;

Rollback command

This command restores the database to last commited state. It is also use with savepoint command to jump to a savepoint in a transaction.

Following is Rollback command's syntax

rollback to savepoint_name;

Savepoint command

savepoint command is used to temporarily save a transaction so that you can rollback to that point whenever necessary.

Following is savepoint command's syntax,

savepoint savepoint_name;

Data Control Language

Data Control Language(DCL) is used to control privilege in Database. To perform any operation in the database, such as for creating tables, sequences or views we need privileges. Privileges are of two types,

- **System :** creating session, table etc are all types of system privilege.
- **Object :** any command or query to work on tables comes under object privilege.

DCL defines two commands,

- **Grant :** Gives user access privileges to database.
- **Revoke :** Take back permissions from user.

To Allow a User to create Session

```
grant create session to username;
```

To Allow a User to create Table

```
grant create table to username;
```

To provide User with some Space on Tablespace to store Table

```
alter user username quota unlimited on system;
```

To Grant all privilege to a User

```
grant sysdba to username
```

To Grant permission to Create any Table

```
grant create any table to username
```

STORED PROCEDURES in SQL:

The SQL Server **Stored procedure** is used to save time to write code again and again by storing the same in database and also get the required output by passing parameters.

Syntax

Following is the basic syntax of Stored procedure creation.

```
Create procedure <procedure_Name>
As
Begin
<SQL Statement>
End
Go
```

Example

Consider the CUSTOMERS table having the following records.

```
ID  NAME      AGE     ADDRESS        SALARY
1  Ramesh     32      Ahmedabad      2000.00
2  Khilan     25      Delhi          1500.00
3  kaushik    23      Kota           2000.00
4  Chaitali   25      Mumbai         6500.00
5  Hardik     27      Bhopal         8500.00
6  Komal      22      MP             4500.00
7  Muffy      24      Indore         10000.00
```

Following command is an example which would fetch all records from the CUSTOMERS table in Testdb database.

```
CREATE PROCEDURE SelectCustomerstabledata

AS

SELECT * FROM Testdb.Customers

GO
```

The above command will produce the following output.

```
ID  NAME      AGE     ADDRESS       SALARY
```

```
1  Ramesh     32      Ahmedabad       2000.00
2  Khilan     25      Delhi           1500.00
3  kaushik    23      Kota            2000.00
4  Chaitali   25      Mumbai          6500.00
5  Hardik     27      Bhopal          8500.00
6  Komal      22      MP              4500.00
7  Muffy      24      Indore          10000.00
```

SQL TRIGGERS

Triggers are stored programs, which are automatically executed or fired when some events occur. Triggers are, in fact, written to be executed in response to any of the following events −

- A **database manipulation (DML)** statement (DELETE, INSERT, or UPDATE)
- A **database definition (DDL)** statement (CREATE, ALTER, or DROP).
- A **database operation** (SERVERERROR, LOGON, LOGOFF, STARTUP, or SHUTDOWN).

Triggers can be defined on the table, view, schema, or database with which the event is associated.

Benefits of Triggers:

Triggers can be written for the following purposes −

- Generating some derived column values automatically
- Enforcing referential integrity
- Event logging and storing information on table access
- Auditing
- Synchronous replication of tables
- Imposing security authorizations
- Preventing invalid transactions

CreatingTriggers

The syntax for creating a trigger is :

```
CREATE [OR REPLACE ] TRIGGER trigger_name

{BEFORE | AFTER | INSTEAD OF }

{INSERT [OR] | UPDATE [OR] | DELETE}

[OF col_name]

ON table_name

[REFERENCING OLD AS o NEW AS n]

[FOR EACH ROW]

WHEN (condition)

DECLARE

  Declaration-statements

BEGIN

  Executable-statements

EXCEPTION

  Exception-handling-statements

END;
```

Where,

- CREATE [OR REPLACE] TRIGGER trigger_name − Creates or replaces an existing trigger with the *trigger_name*.
- {BEFORE | AFTER | INSTEAD OF} − This specifies when the trigger will be executed. The INSTEAD OF clause is used for creating trigger on a view.
- {INSERT [OR] | UPDATE [OR] | DELETE} − This specifies the DML operation.

- [OF col_name] − This specifies the column name that will be updated.
- [ON table_name] − This specifies the name of the table associated with the trigger.
- [REFERENCING OLD AS o NEW AS n] − This allows you to refer new and old values for various DML statements, such as INSERT, UPDATE, and DELETE.
- [FOR EACH ROW] − This specifies a row-level trigger, i.e., the trigger will be executed for each row being affected. Otherwise the trigger will execute just once when the SQL statement is executed, which is called a table level trigger.
- WHEN (condition) − This provides a condition for rows for which the trigger would fire. This clause is valid only for row-level triggers.

Example

To start with, we will be using the CUSTOMERS table we had created and used in the previous chapters −

```
Select * from customers;

+___+............+____+..............+............+
| ID | NAME      | AGE | ADDRESS   | SALARY   |
+___+............+____+..............+............+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
+___+............+____+..............+............+
```

The following program creates a **row-level** trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values −

```
CREATE OR REPLACE TRIGGER display_salary_changes
BEFORE DELETE OR INSERT OR UPDATE ON customers
FOR EACH ROW
WHEN (NEW.ID > 0)
DECLARE
   sal_diff number;
BEGIN
   sal_diff := :NEW.salary - :OLD.salary;
   dbms_output.put_line('Old salary: ' || :OLD.salary);
   dbms_output.put_line('New salary: ' || :NEW.salary);
   dbms_output.put_line('Salary difference: ' || sal_diff);
END;
/
```

When the above code is executed at the SQL prompt, it produces the following result −

```
Trigger created.
```

The following points need to be considered here −

- OLD and NEW references are not available for table-level triggers, rather you can use them for record-level triggers.
- If you want to query the table in the same trigger, then you should use the AFTER keyword, because triggers can query the table or change it again only after the initial changes are applied and the table is back in a consistent state.
- The above trigger has been written in such a way that it will fire before any DELETE or INSERT or UPDATE operation on the table, but you can write your trigger on a

single or multiple operations, for example BEFORE DELETE, which will fire whenever a record will be deleted using the DELETE operation on the table.

TriggeringaTrigger

Let us perform some DML operations on the CUSTOMERS table. Here is one INSERT statement, which will create a new record in the table −

```
INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)

VALUES (7, 'Kriti', 22, 'HP', 7500.00 );
```

When a record is created in the CUSTOMERS table, the above create trigger, **display_salary_changes** will be fired and it will display the following result −

```
Old salary:
New salary: 7500
Salary difference:
```

Because this is a new record, old salary is not available and the above result comes as null. Let us now perform one more DML operation on the CUSTOMERS table. The UPDATE statement will update an existing record in the table −

```
UPDATE customers

SET salary = salary + 500

WHERE id = 2;
```

When a record is updated in the CUSTOMERS table, the above create trigger, **display_salary_changes** will be fired and it will display the following result −

```
Old salary: 1500
New salary: 2000
Salary difference: 500
```

VIEWS IN SQL

- A view is a single *virtual table* that is derived from other tables. The other tables could be base tables or previously defined view.
- Allows for limited update operations Since the table may not physically be stored
- Allows full query operations
- A convenience for expressing certain operations
- A view does not necessarily exist in physical form, which limits the possible update operations that can be applied to views.

CHAPTER – 2

LIBRARY DATABASE

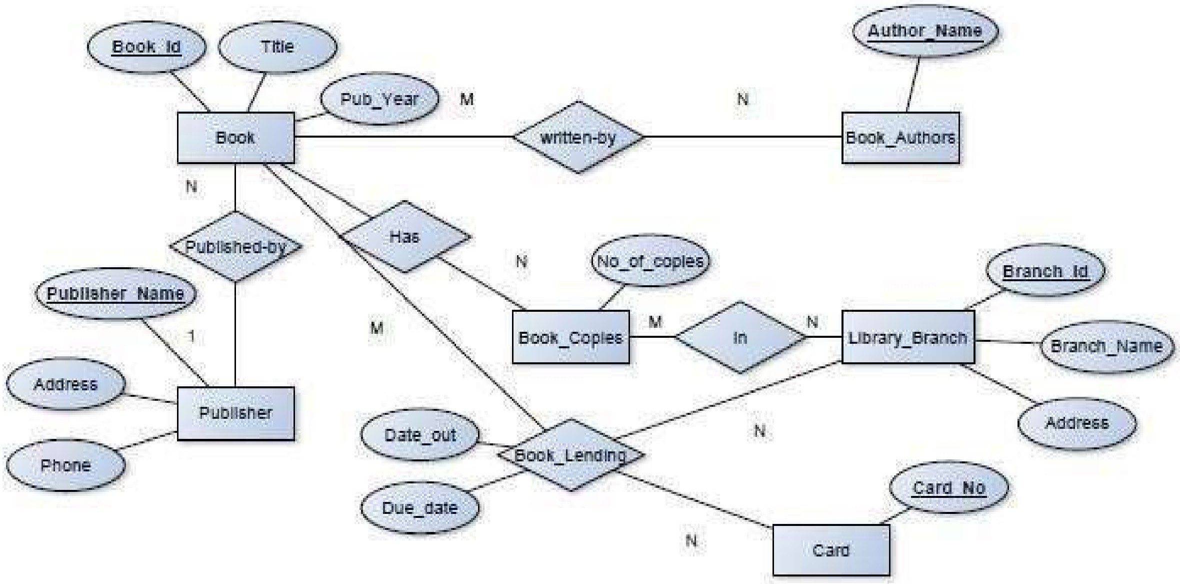
1) Consider the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Program_ID, No-of_Copies)
BOOK_LENDING (Book_id, Program_ID, Card_No, Date_Out, Due_Date)
LIBRARY_PROGRAM (Program_ID, Program_Name, Address)

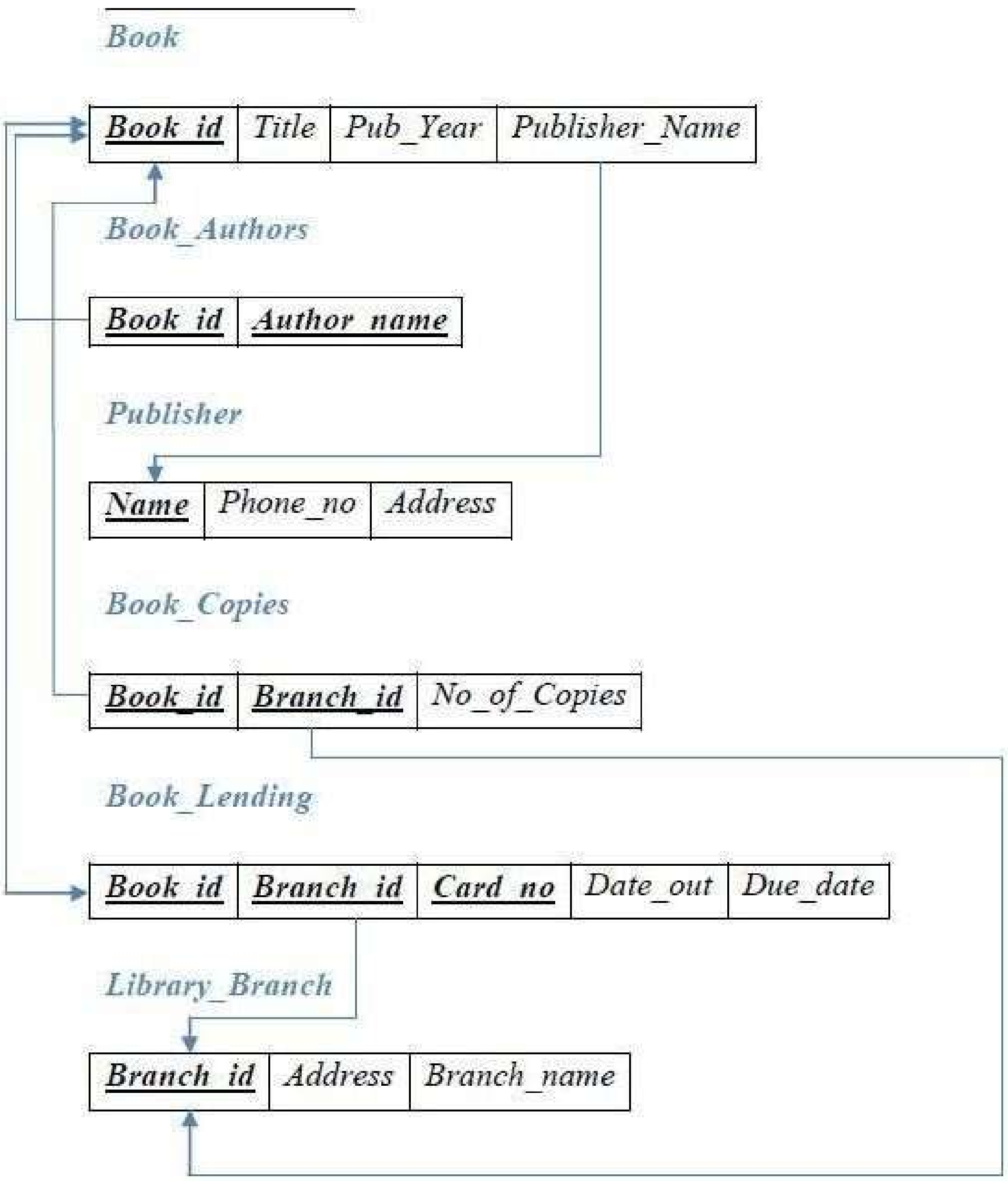
Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library.

ER-Diagram:



SCHEMA:



Book

Book_id	Title	Pub_Year	Publisher_Name

Book_Authors

Book_id	**Author_name**

Publisher

Name	Phone_no	Address

Book_Copies

Book_id	**Branch_id**	No_of_Copies

Book_Lending

Book_id	**Branch_id**	**Card_no**	Date_out	Due_date

Library_Branch

Branch_id	Address	Branch_name

Table Creation:

PUBLISHER

```
SQL> CREATE TABLE PUBLISHER(
        P_NAME VARCHAR2(25) PRIMARY KEY,
        P_ADDRESS VARCHAR2(10),
        PHONE NUMBER(10));

Table created.
```

BOOK

```
SQL> CREATE TABLE BOOK(
        BOOK_ID INTEGER PRIMARY KEY,
        TITLE VARCHAR2(20),
        P_NAME VARCHAR2(20) REFERENCES PUBLISHER(P_NAME)ON DELETE CASCADE,
        PUB_YEAR NUMBER(4));

Table created.
```

BOOK_AUTHORS

```
SQL> CREATE TABLE BOOK_AUTHOR(
        BOOK_ID INTEGER REFERENCES BOOK(BOOK_ID) ON DELETE CASCADE,
        AUTHOR_NAME VARCHAR(20),
        PRIMARY KEY(BOOK_ID, AUTHOR_NAME));

Table created.
```

LIBRARY_PROGRAM

```
SQL> CREATE TABLE LIBRARY_PROGRAM
   (PROGRAM_ID NUMBER(4) PRIMARY KEY,
    PROGRAM_NAME VARCHAR2(20),
        ADDRESS VARCHAR2(15));

Table created.
```

BOOK_COPIES

```
SQL> CREATE TABLE BOOK_COPIES(
        BOOK_ID INTEGER REFERENCES BOOK(BOOK_ID) ON DELETE CASCADE,
        PROGRAM_ID NUMBER(4) REFERENCES LIBRARY_PROGRAM(PROGRAM_ID) ON
        DELETE CASCADE,
        NO_OF_COPIES INTEGER,
        PRIMARY KEY(BOOK_ID, PROGRAM_ID));

Table created.
```

BOOK_LENDING

```
SQL> CREATE TABLE BOOK_LENDING(
        BOOK_ID INTEGER REFERENCES BOOK(BOOK_ID) ON DELETE CASCADE,
        PROGRAM_ID INTEGER REFERENCES LIBRARY_PROGRAM(PROGRAM_ID) ON
        DELETE
                                                                  CASCADE,
        CARD_NO INTEGER REFERENCES CARD(CARD_NO) ON DELETE CASCADE,
        DATE_OUT DATE, DUE_DATE DATE,
        PRIMARY KEY(BOOK_ID, PROGRAM_ID,CARD_NO));

Table created.
```

Values for tables:

PUBLISHER

```
SQL>INSERT INTO PUBLISHER VALUES('PEARSON','BANGALORE','9875462530');

SQL>INSERT INTO PUBLISHER VALUES ('MCGRAW','NEWDELHI','7845691234');

SQL>INSERT INTO PUBLISHER VALUES('SAPNA','BANGALORE','7845963210');
```

BOOK

```
SQL>INSERT INTO BOOK VALUES (1111,'SE','PEARSON',2005);

SQL>INSERT INTO BOOK VALUES (2222,'DBMS','MCGRAW',2004);

SQL>INSERT INTO BOOK VALUES (3333,'ANOTOMY','PEARSON',2010);

SQL>INSERT INTO BOOK VALUES (4444,'ENCYCLOPEDIA','SAPNA',2010);
```

BOOK_AUTHORS

```
SQL>INSERT INTO BOOK_AUTHORS VALUES (1111,'SOMMERVILLE');

SQL>INSERT INTO BOOK_AUTHORS VALUES (2222,'NAVATHE');

SQL>INSERT INTO BOOK_AUTHORS VALUES (3333,'HENRY GRAY');

SQL>INSERT INTO BOOK_AUTHORS VALUES (4444,'RAJ KAMAL');
```

LIBRARY_PROGRAM

```
SQL> INSERT INTO LIBRARY_PROGRAM VALUES(11,'CENTRAL TECHNICAL','MG ROAD');
SQL> INSERT INTO LIBRARY_PROGRAM VALUES(22,'MEDICAL','BH ROAD');
SQL> INSERT INTO LIBRARY_PROGRAM VALUES(33,'CHILDREN','SS PURAM');
SQL> INSERT INTO LIBRARY_PROGRAM VALUES(44,'SECRETARIAT','SIRAGATE');
SQL> INSERT INTO LIBRARY_PROGRAM VALUES(55,'GENERAL','JAYANAGAR');
```

BOOK_COPIES

```
SQL> INSERT INTO BOOK_COPIES VALUES(1111,11,5);
SQL> INSERT INTO BOOK_COPIES VALUES(3333,22,6);
SQL> INSERT INTO BOOK_COPIES VALUES(4444,33,10);
SQL> INSERT INTO BOOK_COPIES VALUES(2222,11,12);
SQL> INSERT INTO BOOK_COPIES VALUES(4444,55,3);
```

BOOK_LENDING

```
SQL> INSERT INTO BOOK_LENDING VALUES(2222,11,1,'10-JAN-2017','20-AUG-2017');
SQL> INSERT INTO BOOK_LENDING VALUES(3333,22,2,'09-JUL-2017','12-AUG-2017');
SQL> INSERT INTO BOOK_LENDING VALUES(4444,55,1,'11-APR-2017','09-AUG-2017');
SQL> INSERT INTO BOOK_LENDING VALUES(2222,11,5,'09-AUG-2017','19-AUG-2017');
SQL> INSERT INTO BOOK_LENDING VALUES(4444,33,1,'10-JUN-2017','15-AUG-2017');
SQL> INSERT INTO BOOK_LENDING VALUES(1111,11,1,'12-MAY-2017','10-JUN-2017');
SQL> INSERT INTO BOOK_LENDING VALUES(3333,22,1,'10-JUL-2017','15-JUL-2017');
```

```
SQL> SELECT * FROM BOOK;

  BOOK_ID     TITLE                           PUBLISHER_NAME    PUB_YEAR
  --------------------------------------      ----------------  --------
        1111 SE                               PEARSON               2005
        2222 DBMS                             MCGRAW                2004
        3333 ANOTOMY                          PEARSON               2010
        4444 ENCYCLOPEDIA                     SAPNA                 2010

  4 rows selected.
```

```
SQL> SELECT * FROM BOOK_AUTHORS;

   BOOK_ID AUTHOR_NAME
---------- ------------------------------
      1111 SOMMERVILLE
      2222 NAVATHE
      3333 HENRY GRAY
      4444 THOMAS

4 rows selected.

SQL> SELECT    * FROM PUBLISHER;

NAME                 ADDRESS              PHONE
-------------------------------------------------------- -------------------
PEARSON              BANGALORE            9875462530
MCGRAW               NEWDELHI             7845691234
SAPNA                BANGALORE            7845963210

3 rows selected.

SQL> SELECT * FROM BOOK_COPIES;

BOOK_ID PROGRAM_ID NO_OF_COPIES
------------- ----------------- ----------------------
    1111         11             5
    3333         22             6
    4444         33            10
    2222         11            12
    4444         55             3

5 rows selected.

SQL> SELECT * FROM BOOK_LENDING;

BOOK_ID    PROGRAM_ID    CARD_NO DATE_OUT  DUE_DATE
---------- ---------- ---------- --------- ---------
    2222       11        1 10-JAN-17 20-AUG-17
    3333       22        2 09-JUL-17 12-AUG-17
    4444       55        1 11-APR-17 09-AUG-17
    2222       11        5 09-AUG-17 19-AUG-17
    4444       33        1 10-JUN-17 15-AUG-17
    1111       11        1 12-MAY-17 10-JUN-17
    1111       33        2 12-MAY-17 10-JUN-17
    4444       11        2 22-MAR-17 10-MAY-17
    3333       11        2 22-MAR-17 10-MAY-17

9 rows selected.
```

```
SQL> SELECT * FROM LIBRARY_PROGRAM;

          PROGRAM_ID PROGRAM_NAME         ADDRESS

                  11 CENTRAL TECHNICAL    MG ROAD
                  22 MEDICAL              BH ROAD
                  33 CHILDREN             SS PURAM
                  44 SECRETARIAT          SIRAGATE
                  55 GENERAL              JAYANAGAR
5 rows selected.
```

Queries:

1) Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.

Varient-1:

```
SQL> SELECT LB.PROGRAM_NAME, B.BOOK_ID, TITLE, PUBLISHER_NAME, AUTHOR_NAME,
                    NO_OF_COPIES
       FROM BOOK B, BOOK_AUTHORS BA, BOOK_COPIES BC, LIBRARY_PROGRAM LB
       WHERE B.BOOK_ID = BA.BOOK_ID AND
                    BA.BOOK_ID = BC.BOOK_ID AND
                   BC.PROGRAM_ID = LB.PROGRAM_ID
       GROUP BY LB.PROGRAM_NAME, B.BOOK_ID, TITLE, PUBLISHER_NAME, AUTHOR_NAME,
                   NO_OF_COPIES;
```

Varient-2:

```
SQL> SELECT LB.PROGRAM_NAME, B.BOOK_ID, TITLE, P_NAME, AUTHOR_NAME, NO_OF_COPIES
       FROM BOOK B JOIN BOOK_AUTHORS BA ON B.BOOK_ID = BA.BOOK_ID, BOOK_COPIES BC,
               LIBRARY_PROGRAM LB
       WHERE BA.BOOK_ID = BC.BOOK_ID AND BC.PROGRAM_ID = LB.PROGRAM_ID
       GROUP BY LB.PROGRAM_NAME, B.BOOK_ID, TITLE, P_NAME, AUTHOR_NAME, NO_OF_COPIES;
```

Varient-3:

```
SQL> SELECT LB.PROGRAM_NAME, B.BOOK_ID, TITLE, P_NAME, AUTHOR_NAME, NO_OF_COPIES
       FROM BOOK B JOIN BOOK_AUTHORS BA ON B.BOOK_ID = BA.BOOK_ID JOIN BOOK_COPIES BC
                    ON BA.BOOK_ID = BC.BOOK_ID JOIN LIBRARY_PROGRAM LB ON BC.PROGRAM_ID
                    = LB.PROGRAM_ID
       GROUP BY LB.PROGRAM_NAME, B.BOOK_ID, TITLE, P_NAME, AUTHOR_NAME, NO_OF_COPIES;
```

OUTPUT:

```
PROGRAM_NAME     BOOK_ID  TITLE       PUBLISHER_NAME  AUTHOR_NAME       NO_OF_COPIES
-------------------------  ----------  --------------  -----------------------------
GENERAL             4444  ENCYCLOPE   SAPNA           THOMAS                       3
                          DIA
MEDICAL             3333  ANOTOMY     PEARSON         HENRY GRAY                   6

CHILDREN            4444  ENCYCLOPE   SAPNA           THOMAS                      10
                          DIA
CENTRAL             1111  SE          PEARSON         SOMMERVILLE                  5
TECHNICAL
CENTRAL             2222  DBMS        MCGRAW          NAVATHE                     12
TECHNICAL
```

2) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017to Jun 2017.

Varient-1:

```
SQL> SELECT CARD_NO
     FROM BOOK_LENDING
     WHERE DATE_OUT BETWEEN '01-JAN-2017' AND '30-JUN-2017'
     GROUP BY CARD_NO
     HAVING COUNT (*) > 3;
```

Varient-2:

```
SQL> SELECT CARD_NO
     FROM BOOK_LENDING
     WHERE DATE_OUT BETWEEN '01-JAN-2017' AND '30-JUN-2017'
     GROUP BY CARD_NO
     HAVING COUNT (*) > = 4;
```

Varient-3:

```
SQL> SELECT CARD_NO
     FROM BOOK_LENDING
     WHERE DATE_OUT >=  '01-JAN-2017' AND  DATE_OUT <= '30-JUN-2017'
     GROUP BY CARD_NO
     HAVING COUNT (*) > = 4;
```

OUTPUT:

```
 CARD_NO
----------------
     1
```

3) Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.

Varient-1:

```
DELETE FROM BOOK
WHERE BOOK_ID = '3333';

1 row deleted.
```

Varient-2:

```
DELETE FROM BOOK
WHERE BOOK_ID IN ( '3333' );

1 row deleted.
```

Varient-3:

```
DELETE FROM BOOK_LENDING
WHERE BOOK_ID = '3333';

1 row deleted.

DELETE FROM BOOK_COPIES
WHERE BOOK_ID = '3333';

1 row deleted.

DELETE FROM BOOK_AUTHORS
WHERE BOOK_ID = '3333';

1 row deleted.

DELETE FROM BOOK
WHERE BOOK_ID = '3333';

1 row deleted.
```

OUTPUT:

```
SQL> SELECT * FROM BOOK;

   BOOK_ID TITLE                          PUBLISHER_NAME                   PUB_YEAR
---------- ------------------------------ ------------------------------ ----------
      1111 SE                             PEARSON                              2005
      2222 DBMS                           MCGRAW                               2004
      4444 ENCYCLOPEDIA                   SAPNA                                2010


SQL> SELECT * FROM BOOK_COPIES;

BOOK_ID PROGRAM_ID NO_OF_COPIES
---------- ---------- ------------
      1111         11            5
      4444         33           10
      2222         11           12
      4444         55            3
```

```
SQL> SELECT * FROM BOOK_LENDING;

   BOOK_ID PROGRAM_ID   CARD_NO DATE_OUT   DUE_DATE
   ------------ ---------------- ----------------------------------- ----------------
         2222             11                 1 10-JAN-17     20-AUG-17
         4444             55                 1 11-APR-17     09-AUG-17
         2222             11                 5 09-AUG-17     19-AUG-17
         4444             33                 1 10-JUN-17     15-AUG-17
         1111             11                 1 12-MAY-17      10-JUN-17
```

4) Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.

Varient-1:

```
SQL> SELECT BOOK_ID, TITLE, PUBLISHER_NAME, PUB_YEAR
        FROM BOOK
        GROUP BY PUB_YEAR, BOOK_ID, TITLE, PUBLISHER_NAME;
```

Varient-2:

```
SQL> SELECT BOOK_ID, TITLE, PUBLISHER_NAME, PUB_YEAR
        FROM BOOK
        GROUP BY PUB_YEAR, BOOK_ID, TITLE, PUBLISHER_NAME
        ORDER BY PUB_YEAR;
```

Varient-3:

```
SQL> SELECT BOOK_ID, TITLE, PUBLISHER_NAME, PUB_YEAR
        FROM BOOK
        GROUP BY PUB_YEAR, BOOK_ID, TITLE, PUBLISHER_NAME;
```

OUTPUT:

```
BOOK_ ID TITLE                          PUBLISHER_NAME          PUB_YEAR
----------------------------------------------------- --------------------------------- --------------
     2222    DBMS                       MCGRAW                       2004
     1111    SE                         PEARSON                      2005
     3333    ANOTOMY                    PEARSON                      2010
     4444    ENCYCLOPEDIA               SAPNA                        2010
```

5) Create a view of all books and its number of copies that are currently available in the Library.

Varient-1:

```
SQL> CREATE VIEW BOOKS_AVAILABLE AS
        SELECT B. BOOK_ID, B. TITLE, C.NO_OF_COPIES
        FROM LIBRARY_PROGRAM L, BOOK B, BOOK_COPIES C
        WHERE B. BOOK_ID = C. BOOK_ID AND L. PROGRAM_ID = C. PROGRAM_ID;

        View created.
```

Varient-2:

```
SQL> CREATE VIEW BOOKS_AVAILABLE1 AS
        SELECT C.BOOK_ID, B. TITLE, C.NO_OF_COPIES
        FROM LIBRARY_PROGRAM L JOIN BOOK_COPIES C ON L. PROGRAM_ID = C. PROGRAM_ID,
                BOOK B
        WHERE C.BOOK_ID = B.BOOK_ID;

        View created.
```

Varient-3:

```
SQL> CREATE VIEW BOOKS_AVAILABLE2 AS
        SELECT C.BOOK_ID, B. TITLE, C.NO_OF_COPIES
        FROM LIBRARY_PROGRAM L JOIN BOOK_COPIES C ON L. PROGRAM_ID = C. PROGRAM_ID
        JOIN  BOOK B ON C.BOOK_ID = B.BOOK_ID;

        View created.
```

OUTPUT:

```
SQL> SELECT * FROM BOOKS_AVAILABLE;

BOOK_ID TITLE                              NO_OF_COPIES
------------------------------------       ---------------------
   1111 SE                                            5
   3333 ANOTOMY                                       6
   4444 ENCYCLOPEDIA                                 10
   2222 DBMS                                         12
   4444 ENCYCLOPEDIA                                  3
```

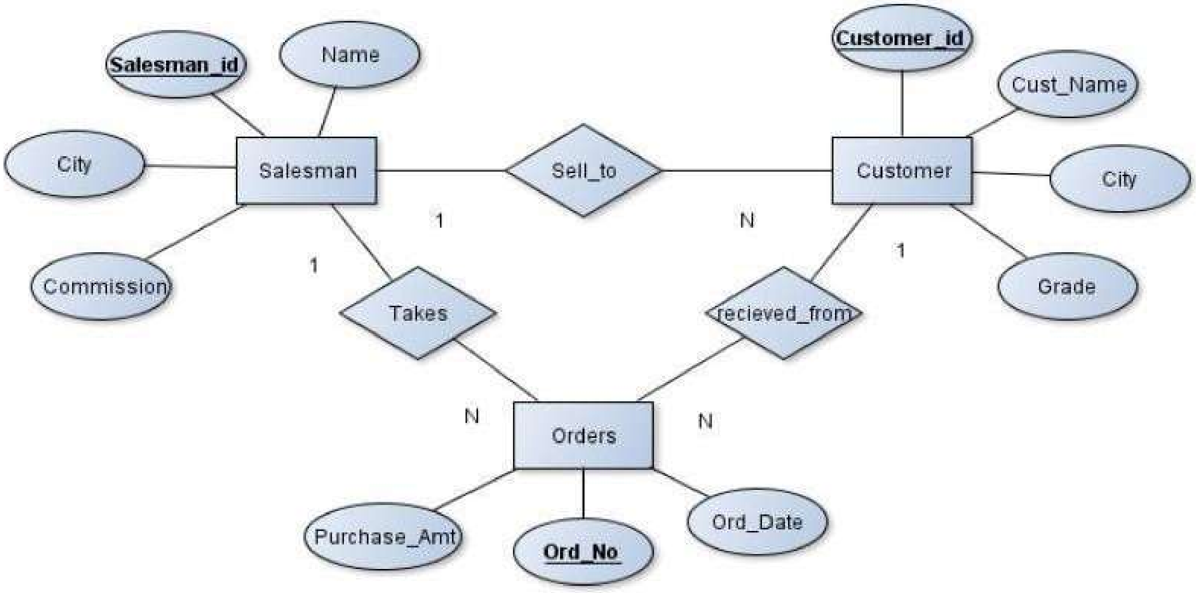
CHAPTER – 3

ORDER DATABASE

2) Consider the following schema for Order Database:
SALESMAN (Salesman_id, Name, City, Commission)
CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
Write SQL queries to

1. Count the customers with grades above Bangalore's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

<u>ER-Diagram:</u>



SCHEMA:

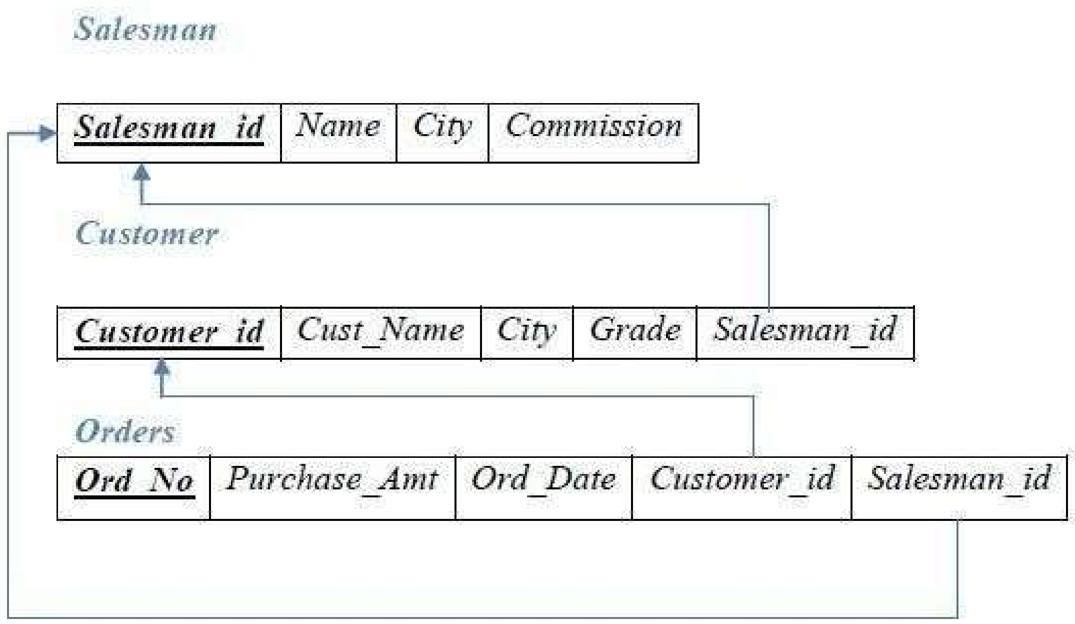

Salesman
Salesman_id
Name
City
Commission
Customer
Customer_id
Cust_Name
City
Grade
Salesman_id
Orders
Ord_No
Purchase_Amt
Ord_Date
Customer_id
Salesman_id

Table Creation:

SALESMAN

```
CREATE TABLE SALESMAN (
SALESMAN_ID NUMBER(5) CONSTRAINT SALESMAN_SALID PRIMARY KEY,
NAME VARCHAR(10) CONSTRAINT SALESMAN_NAME_NN NOT NULL,
CITY VARCHAR(15) CONSTRAINT SALESMAN_CITY_NN NOT NULL,
COMMISSION NUMBER(5));

Table created.
```

CUSTOMER

```
CREATE TABLE CUSTOMER (
CUSTOMER_ID NUMBER (5) CONSTRAINT CUSTOMER_CUSTID_PK PRIMARY KEY,
CUST_NAME VARCHAR2 (10) CONSTRAINT CUSTOMER_CUSTNAME_NN NOT NULL,
CITY VARCHAR(10) CONSTRAINT CUSTOMER_CITY_NN NOT NULL,
GRADE NUMBER(5) CONSTRAINT CUSTOMER_GRADE_NN NOT NULL,
SALESMAN_ID NUMBER(5) CONSTRAINT CUSTOMER_SALEID_FK REFERENCES
SALESMAN(SALESMAN_ID) ON DELETE SET NULL);

Table created.
```

ORDERS

```
CREATE TABLE ORDERS (
ORD_NO NUMBER(5) CONSTRAINT ORDERS_ODNO_PK PRIMARY KEY,
PURCHASE_AMT INTEGER CONSTRAINT ORDERS_PAMT_NN NOT NULL,
ORD_DATE DATE CONSTRAINT ORDERS_ODATE_NN NOT NULL,
CUSTOMER_ID NUMBER (5) CONSTRAINT ORDERS_CUSTID_FK REFERENCES
CUSTOMER(CUSTOMER_ID),
SALESMAN_ID NUMBER(5) CONSTRAINT ORDERS_SALEID_FK REFERENCES
SALESMAN(SALESMAN_ID) ON DELETE CASCADE);

Table created.
```

Values for tables

```
SQL> INSERT INTO SALESMAN VALUES(&SALESMAN_ID,'&NAME','&CITY',&COMMISSION);

SQL> INSERT INTO CUSTOMER
        VALUES(&CUSTOMER_ID,'&CUST_NAME','&CITY','&GRADE',&SALESMAN_ID);

SQL> INSERT INTO ORDERS
  VALUES(&ORD_NO,&PURCHASE_AMT,'&ORD_DATE',&CUSTOMER_ID,&SALESMAN_ID);
```

SELECT * FROM SALESMAN;

```
SALESMAN_ID NAME          CITY                COMMISSION
--------------------------------- -------------------- -------------
         1000 RAJ          BENGALURU                   50
         2000 ASHWIN       TUMKUR                      30
         3000 BINDU        MUMBAI                      40
         4000 LAVANYA      BENGALURU                   40
         5000 ROHIT        MYSORE                      60
```

SELECT * FROM CUSTOMER;

```
CUSTOMER_ID CUST_NAME  CITY            GRADE  SALESMAN_ID
-------------- ------------ ---------------- ------- --------------
           11  INFOSYS     BENGALURU          5          1000
           22  TCS         BENGALURU          4          2000
           33  WIPRO       MYSORE             7          1000
           44  TCS         MYSORE             6          2000
           55  ORACLE      TUMKUR             3          3000
```

SELECT * FROM ORDERS;

```
    ORD_NO PURCHASE_AMT ORD_DATE  CUSTOMER_ID SALESMAN_ID
------------ --------------- ----------- -------------- --------------
          1         200000  12-APR-16           11         1000
          2         300000  12-APR-16           11         2000
          3         400000  15-APR-17           22         1000
```

QUERIES:

1. **Count the customers with grades above Bangalore’s average.**

Varient-1:

```
SELECT COUNT(CUSTOMER_ID)
 FROM CUSTOMER
 WHERE GRADE > (SELECT AVG(GRADE)
                  FROM CUSTOMER
                  WHERE CITY LIKE '%BENGALURU’);
```

Varient-2:

```
SELECT COUNT(CUSTOMER_ID)
 FROM CUSTOMER
 WHERE GRADE > (SELECT AVG(GRADE)
                  FROM CUSTOMER
                  WHERE CITY ='BENGALURU’);
```

Varient-3:

```
SELECT COUNT(CUSTOMER_ID)
 FROM CUSTOMER
 WHERE GRADE > (SELECT AVG(GRADE)
                     FROM CUSTOMER
                     WHERE CITY IN ('BENGALURU', 'BANGALORE'));
```

OUTPUT:

```
                    COUNT(CUSTOMER_ID)
                    ----------------------------------
                             3
```

2. Find the name and numbers of all salesmen who had more than one customer.

Varient-1:

```
SELECT NAME, COUNT(CUSTOMER_ID)
FROM  SALESMAN  S,  CUSTOMER C
WHERE S.SALESMAN_ID = C.SALESMAN_ID
GROUP BY S.SALESMAN_ID, NAME
 HAVING COUNT(CUSTOMER_ID) > 1;
```

Varient-2:

```
SELECT NAME, COUNT(CUSTOMER_ID)
FROM  SALESMAN  S,  CUSTOMER C
WHERE S.SALESMAN_ID = C.SALESMAN_ID
GROUP BY S.SALESMAN_ID, NAME
 HAVING COUNT(CUSTOMER_ID) > = 2;
```

Varient-3:

```
SELECT NAME, COUNT(CUSTOMER_ID)
FROM  SALESMAN  S JOIN CUSTOMER C ON S.SALESMAN_ID = C.SALESMAN_ID
GROUP BY S.SALESMAN_ID, NAME
 HAVING COUNT(CUSTOMER_ID) > 1;
```

OUTPUT:

```
NAME             COUNT(CUSTOMER_ID)
--------------   ------------------------------
ASHWIN                               2
RAJ                                  2
```

3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)

Varient-1:

```
(SELECT NAME
 FROM SALESMAN S, CUSTOMER C
 WHERE S.SALESMAN_ID=C.SALESMAN_ID AND S.CITY=C.CITY)
UNION
(SELECT NAME
 FROM SALESMAN
 WHERE SALESMAN_ID NOT IN (SELECT S1.SALESMAN_ID
                           FROM SALESMAN S1, CUSTOMER C1
                           WHERE S1.SALESMAN_ID=C1.SALESMAN_ID AND
                                S1.CITY=C1.CITY));
```

Varient-2:

```
(SELECT NAME
 FROM SALESMAN S, CUSTOMER C
 WHERE S.SALESMAN_ID=C.SALESMAN_ID AND S.CITY=C.CITY)
UNION
 (SELECT NAME
  FROM SALESMAN
  WHERE EXISTS (SELECT *
                FROM SALESMAN S1, CUSTOMER C1
                WHERE S1.SALESMAN_ID=C1.SALESMAN_ID
                   AND S1.CITY=C1.CITY));
```

VARIENT-3:

```
(SELECT NAME
 FROM SALESMAN S JOIN CUSTOMER C ON S.SALESMAN_ID=C.SALESMAN_ID
 WHERE S.CITY=C.CITY)
UNION
(SELECT NAME
 FROM SALESMAN
 WHERE SALESMAN_ID NOT IN (SELECT S1.SALESMAN_ID
                           FROM SALESMAN S1 JOIN CUSTOMER C1 ON
                                 S1.SALESMAN_ID=C1.SALESMAN_ID
                           WHERE S1.CITY=C1.CITY));
```

OUTPUT:

```
NAME
--------------------------
ASHWIN
BINDU
LAVANYA
RAJ
ROHIT
```

4. Create a view that finds the salesman who has the customer with the highest order of a day.

Varient-1:

```
CREATE VIEW SALES_HIGHERORDER AS
SELECT SALESMAN_ID, PURCHASE_AMT
FROM ORDERS
WHERE PURCHASE_AMT= (SELECT MAX ( O.PURCHASE_AMT)
                       FROM ORDERS O
                       WHERE O.ORD_DATE = '12-APR-16');
View created.
```

Varient-2:

```
CREATE VIEW SALES_HIGHERORDER1 AS
SELECT A.SALESMAN_ID, ORD_DATE, PURCHASE_AMT
FROM SALESMAN A, ORDERS B
WHERE A.SALESMAN_ID = B.SALESMAN_ID AND
        B.PURCHASE_AMT = (SELECT MAX (PURCHASE_AMT)
                           FROM ORDERS C
                           WHERE C.ORD_DATE = B.ORD_DATE);

View created.
```

Varient-3:

```
CREATE VIEW SALES_HIGHERORDER2 AS
SELECT A.SALESMAN_ID, ORD_DATE, PURCHASE_AMT
FROM SALESMAN A JOIN ORDERS B ON A.SALESMAN_ID = B.SALESMAN_ID
WHERE B.PURCHASE_AMT = (SELECT MAX (PURCHASE_AMT)
                         FROM ORDERS C
                         WHERE C.ORD_DATE = B.ORD_DATE);
```

OUTPUT:

```
SQL> SELECT * FROM SALES_HIGHERORDER;

SALESMAN_ID PURCHASE_AMT
----------- ------------
       2000       300000


SQL> SELECT * FROM SALES_HIGHERORDER2;

SALESMAN_ID ORD_DATE   PURCHASE_AMT
----------- ---------- ------------
   2000     12-APR-16   300000
   1000     16-APR-17   400000
```

5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

Varient-1:

```
DELETE from salesman
WHERE salesman_id = 1000;

1 row deleted.
```

Varient-2:

```
DELETE from salesman
WHERE salesman_id IN (1000);

1 row deleted.
```

Varient-3:

```
DELETE from customer
WHERE salesman_id IN (SELECT salesman_id
                      FROM customer
                      Where salesman_ID = 1000);

1 row deleted.
```

OUTPUT:

```
SQL> SELECT * FROM SALESMAN;

SALESMAN_ID NAME          CITY                    COMMISSION
----------------------------  -------------------------  -------------------------------------  ...................................

        2000ASHWIN        TUMKUR                          30
        3000BINDU          MUMBAI                         40
        4000LAVANYA       BENGALURU                       40
        5000ROHIT         MYSORE                          60

SQL> SELECT * FROM CUSTOMER;

CUSTOMER_ID CUST_NAME   CITY               GRADE SALESMAN_ID
------------------------------------------------------------------------------------------  ..........................  ----------------------------

          11INFOSYS    BENGALURU              5
          22TCS        BENGALURU              4          2000
          33WIPRO          MYSORE             7
          44TCS            MYSORE             6          2000
          55ORACLE         TUMKUR             3          3000


SQL> SELECT * FROM ORDERS;

  ORD_NO PURCHASE_AMT   ORD_DATE   CUSTOMER_ID   SALESMAN_ID
-----------------------  ------------------------------ -----------------------  ----------------------------  -------------------------

          2         30000012-APR-16               11            2000
```

CHAPTER – 4

MOVIE DATABASE

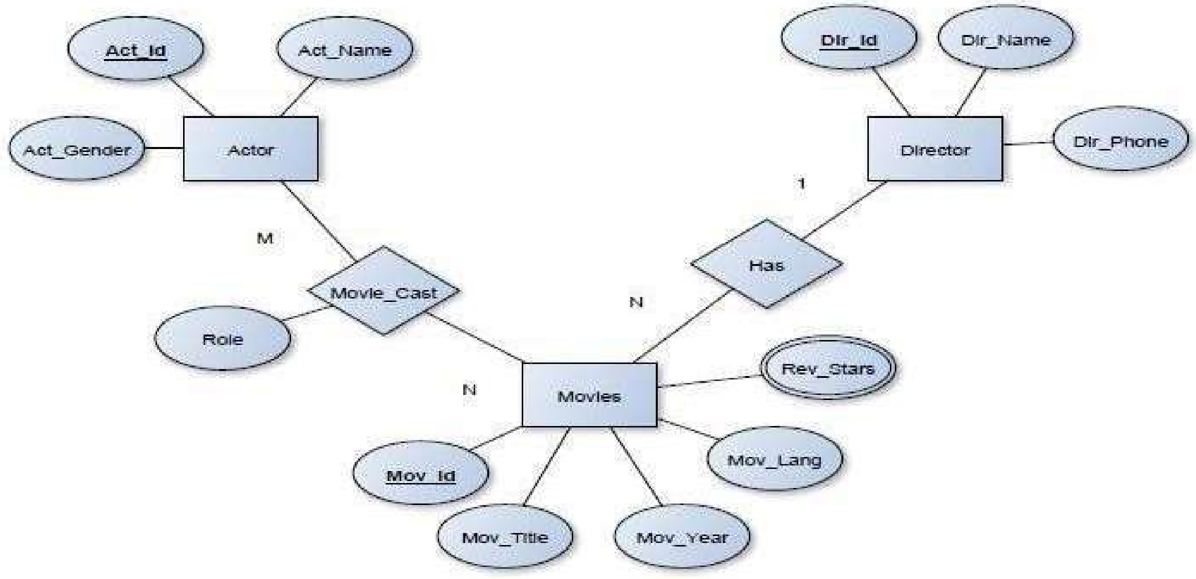
3) Consider the schema for Movie Database:

ACTOR (*<u>Act_id</u>, Act_Name, Act_Gender*)
DIRECTOR (*<u>Dir_id</u>, Dir_Name, Dir_Phone*)
MOVIES (*<u>Mov_id</u>, Mov_Title, Mov_Year, Mov_Lang, Dir_id*)
MOVIE_CAST (*<u>Act_id</u>, <u>Mov_id</u>, Role*)
RATING (*<u>Mov_id</u>, Rev_Stars*)

Write SQL queries to

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

<u>ER-Diagram:</u>



SCHEMA:

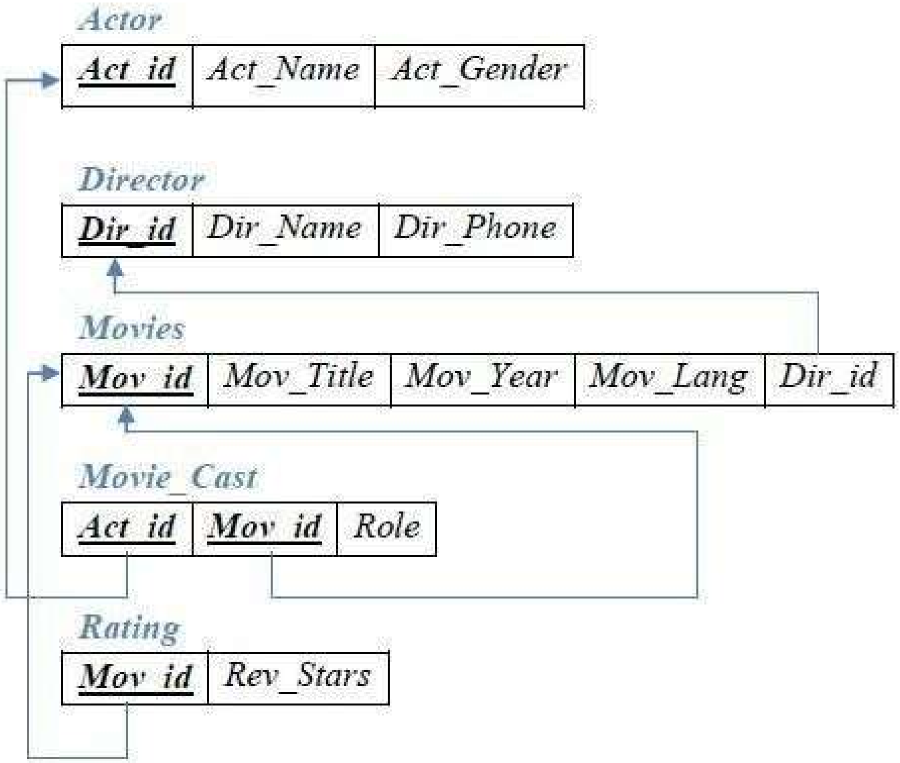

Actor
Act_id
Act_Name
Act_Gender
Director
Dir_id
Dir_Name
Dir_Phone
Movies
Mov_id
Mov_Title
Mov_Year
Mov_Lang
Dir_id
Movie_Cast
Act_id
Mov_id
Role
Rating
Mov_id
Rev_Stars

Table Creation:

ACTOR

```
CREATE TABLE ACTOR(
ACT_ID NUMBER(5) CONSTRAINT ACTOR_ACTID_PK PRIMARY KEY,
ACT_NAME VARCHAR(18) CONSTRAINT ACTOR_ACTNAME_NN NOT NULL,
ACT_GENDER VARCHAR(2) CONSTRAINT ACTOR_ACTGENDER_NN NOT
NULL);
```

```
Table created.
```

DIRECTOR

```
CREATE TABLE DIRECTOR(
DIR_ID NUMBER(5) CONSTRAINT DIRECTOR_DIRID_PK PRIMARY KEY,
DIR_NAME VARCHAR(18) CONSTRAINT DIRECTOR_DIRNAME_NN NOT NULL,
DIR_PHONE VARCHAR(10) CONSTRAINT DIRECTOR_DIRPHONE_NN NOT NULL);
```

```
Table created.
```

MOVIES

```
CREATE TABLE MOVIES(
MOV_ID NUMBER(5) CONSTRAINT MOVIES_MOVID_PK PRIMARY KEY,
MOV_TITLE VARCHAR(10) CONSTRAINT MOVIES_MOVTITLE_NN NOT NULL,
MOV_YEAR NUMBER(5) CONSTRAINT MOVIES_MOVYEAR_NN NOT NULL,
MOV_LANG VARCHAR(10)    CONSTRAINT MOVIES_MOVLANG_NN NOT
NULL,
DIR_ID NUMBER(5) CONSTRAINT MOVIES_DIRID_FK REFERENCES DIRECTOR(DIR_ID));
```

```
Table created.
```

MOVIE_CAST

```
CREATE TABLE MOVIE_CAST(
ACT_ID NUMBER(5) CONSTRAINT MOVIECAST_ACTID_FK REFERENCES ACTOR(ACT_ID),
MOV_ID NUMBER(5) CONSTRAINT MOVIECAST_MOVID_FK REFERENCES
MOVIES(MOV_ID),ROLE VARCHAR(10),
CONSTRAINT MOVIECAST_ACTID_MOVID_PK PRIMARY KEY(ACT_ID,MOV_ID));
```

```
Table created.
```

RATING

```
CREATE TABLE RATING(
MOV_ID NUMBER(5) CONSTRAINT RATING_MOVID_FK REFERENCES MOVIES(MOV_ID),
REV_STARS NUMBER(1) CONSTRAINT RATING_REVSTARS_NN NOT NULL,
CONSTRAINT RATING_MOVID_PK PRIMARY KEY(MOV_ID))
```

```
Table created.
```

Description of Schema:

```
SQL> DESC ACTOR
 Name                                       Null?     Type
 ------------------------------------------ --------- ----------
 ACT_ID                                     NOT NULL NUMBER(5)
 ACT_NAME                                   NOT NULL VARCHAR2(18)
 ACT_GENDER                                 NOT NULL VARCHAR2(2)

SQL> DESC DIRECTOR
 Name                                       Null?     Type
 ------------------------------------------ --------- ----------
 DIR_ID                                     NOT NULL NUMBER(5)
 DIR_NAME                                   NOT NULL VARCHAR2(18)
 DIR_PHONE                                  NOT NULL VARCHAR(10)

SQL> DESC MOVIES
 Name                                       Null?     Type
 ------------------------------------------ --------- ----------
 MOV_ID                                     NOT NULL NUMBER(5)
 MOV_TITLE                                  NOT NULL VARCHAR2(10)
 MOV_YEAR                                   NOT NULL NUMBER(5)
 MOV_LANG                                   NOT NULL VARCHAR2(10)
 DIR_ID                                               NUMBER(5)

SQL> DESC RATING
 Name                                       Null?     Type
 ------------------------------------------ --------- ----------
 MOV_ID                                     NOT NULL NUMBER(5)
 REV_STARS                                  NOT NULL NUMBER(1)
```

Values for tables:

```
SQL> INSERT INTO ACTOR VALUES(&ACT_ID,'&ACT_NAME','&ACT_GENDER');
SQL> INSERT INTO DIRECTOR VALUES(&DIR_ID,'&DIR_NAME',&DIR_PHONE);
SQL> INSERT INTO MOVIES VALUES (&MOV_ID,' &MOV_TITLE', '&MOV_YEAR',
        ‘&MOV_LANG', &DIR_ID);
SQL> INSERT INTO MOVIE_CAST VALUES(&ACT_ID,&MOV_ID,'&ROLE');
SQL> INSERT INTO RATING VALUES (&MOV_ID, &REV_STARS);
```

```
SQL> SELECT * FROM ACTOR;

    ACT_ID ACT_NAME           AC
---------- ------------------ --
       111 DEEPA SANNIDHI   F
       222 SUDEEP             M
       333 PUNEETH            M
       444 DHIGANTH           M
       555 ANGELA             F
```

```
          SQL> SELECT * FROM DIRECTOR;

    DIR_ID  DIR_NAME                    DIR_PHON
                                           E
----------  --------------------------  ----------
       101  HITCHCOCK                    112267809
       102  RAJ MOULI                    152358709
       103  YOGARAJ                      272337808
       104  STEVEN SPIELBERG             363445678
       105  PAVAN KUMAR                  385456809
```

```
SQL> SELECT * FROM MOVIES;

    MOV_ID MOV_TITLE      MOV_YEAR MOV_LANG        DIR_ID
---------------------------------- ---------- -------------- ----------
      1111 LASTWORLD           2009  ENGLISH            104
      2222 EEGA                2010  TELUGU             102
      4444 PARAMATHMA          2012  KANNADA            103
      3333 MALE                2006  KANNADA            103
      5555 MANASARE            2010  KANNADA            103
      6666 REAR WINDOW         1954  ENGLISH            101
      7777 NOTORIOUS           1946  ENGLISH            101
```

```
SQL> SELECT * FROM MOVIE_CAST;

    ACT_ID      MOV_ID ROLE
---------- ----------------------
       222        2222 VILAN
       333        4444 HERO
       111        4444 HEROIN
       444        3333 GUEST
       444        5555 HERO
       555        7777 MOTHER
```

```
SQL> SELECT * FROM RATING;
    MOV_ID REV_STARS
---------- ----------
      1111          3
      2222          4
      3333          3
      5555          4
      4444          5
```

1. List the titles of all movies directed by ‘Hitchcock’.

Variant-1

```
SELECT MOV_TITLE
FROM MOVIES M, DIRECTOR D
WHERE D.DIR_ID=M.DIR_ID AND
      DIR_NAME='HITCHCOCK';
```

Variant-2

```
SELECT MOV_TITLE
FROM MOVIES M NATURAL JOIN DIRECTOR D
WHERE DIR_NAME='HITCHCOCK';
```

Variant-3

```
SELECT MOV_TITLE
FROM MOVIES M  INNER JOIN DIRECTOR D ON D.DIR_ID=M.DIR_ID
WHERE DIR_NAME='HITCHCOCK';
```

OUTPUT

```
 MOV_TITLE
-----------
NOTORIOUS
REAR WINDOW
```

2.Find the movie names where one or more actors acted in two or more movies.

VARIANT-1

```
SELECT MOV_TITLE
FROM MOVIES M, MOVIE_CAST MC
WHERE M.MOV_ID=MC.MOV_ID AND
      MC.ACT_ID IN (SELECT ACT_ID
                    FROM MOVIE_CAST
                    GROUP BY ACT_ID
                    HAVING COUNT(MOV_ID)>=2);
```

VARIANT-2

```
SELECT MOV_TITLE
FROM MOVIES M NATURAL JOIN MOVIE_CAST MC
WHERE MC.ACT_ID IN (SELECT ACT_ID
                    FROM MOVIE_CAST
                    GROUP BY ACT_ID
                    HAVING COUNT(MOV_ID)>=2);
```

VARIANT-3

```
SELECT MOV_TITLE
FROM MOVIES M NATURAL JOIN MOVIE_CAST MC
WHERE MC.ACT_ID NOT IN (SELECT ACT_ID
                    FROM MOVIE_CAST
                    GROUP BY ACT_ID
                    HAVING COUNT(MOV_ID)<2);
```

```
MOV_TITLE
--------------------------
MALE
MANASARE
```

1. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).

VARIANT-1

```
        (SELECT ACT_NAME
        FROM  ACTOR  A JOIN MOVIE_CAST CON A.ACT_ID=C.ACT_ID
         JOIN MOVIES M ON C.MOV_ID=M.MOV_ID
        WHERE M.MOV_YEAR < 2000)
INTERSECT
        (SELECT ACT_NAME
        FROM ACTOR A JOINMOVIE_CAST C ON  A.ACT_ID=C.ACT_ID  JOIN
        MOVIES M ON C.MOV_ID=M.MOV_ID
        WHERE M.MOV_YEAR > 2015);
```

VARIANT-2

```
        (SELECT ACT_NAME
        FROM  ACTOR  A NATURAL JOIN MOVIE_CAST CJOIN MOVIES M ON
        C.MOV_ID=M.MOV_ID
        WHERE M.MOV_YEAR < 2000)
INTERSECT
        (SELECT ACT_NAME
        FROM ACTOR A JOINMOVIE_CAST C ON  A.ACT_ID=C.ACT_ID  JOIN
        MOVIES M ON C.MOV_ID=M.MOV_ID
        WHERE M.MOV_YEAR > 2015);
```

VARIANT-3

```
SELECT ACT_NAME
FROM  ACTOR  A NATURAL JOIN MOVIE_CAST C NATURAL JOIN MOVIES M
WHERE M.MOV_YEAR < 2000)
INTERSECT
(SELECT ACT_NAME
FROM ACTOR A JOINMOVIE_CAST C ON  A.ACT_ID=C.ACT_ID  JOIN
MOVIES M ON C.MOV_ID=M.MOV_ID
WHERE M.MOV_YEAR > 2015);
```

OUTPUT:

```
ACT_NAME
-------------------------
DHIGANTH
```

4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.

VARIANT-1

```
SELECT   MOV_TITLE,   REV_STARS
FROM MOVIES M, RATING R
WHERE M.MOV_ID=R.MOV_ID AND REV_STARS>=1
ORDER BY MOV_TITLE
```

VARIANT-2

```
SELECT   MOV_TITLE,   REV_STARS
FROM MOVIES AS M, RATING AS R
WHERE M.MOV_ID=R.MOV_ID AND REV_STARS>=1
ORDER BY MOV_TITLE
```

VARIANT-3

```
SELECT   MOV_TITLE,   REV_STARS
FROM MOVIES M, RATING R
WHERE M.MOV_ID=R.MOV_ID AND REV_STARS>=1
ORDER BY MOV_TITLE ASC
```

```
MOV_TITLE  REV_STARS
----------- ----------
EEGA             4
LASTWORLD        3
MALE             3
MANASARE         4
PARAMATHMA       5
```

5. Update rating of all movies directed by ‘Steven Spielberg’ to 5.

VARIANT-1

```
UPDATE RATING
SET REV_STARS=5
WHERE MOV_ID IN (SELECT MOV_ID
           FROM MOVIES M, DIRECTOR D
           WHERE M.DIR_ID=D.DIR_ID AND
           DIR_NAME='STEVEN SPIELBERG');

1 row updated.
```

VARIANT-2

```
UPDATE RATING
SET REV_STARS=5
WHERE MOV_ID IN (SELECT MOV_ID
           FROM MOVIES M, DIRECTOR D
           WHERE M.DIR_ID=D.DIR_ID AND
           DIR_NAME LIKE 'STEVEN
           SPIELBERG');
```

VARIANT-3

```
UPDATE RATING
SET REV_STARS>4
WHERE MOV_ID IN (SELECT MOV_ID
           FROM MOVIES M NATURAL JOIN
           DIRECTOR D WHERE DIR_NAME
           LIKE 'STEVEN SPIELBERG');
```

OUTPUT:

```
SELECT * FROM RATING

MOV_ID REV_STARS
------ ------------
 1111      5
 2222      4
 3333      3
 5555      4
 4444      5
```

CHAPTER - 5

COLLEGE DATABASE

4). Consider the schema for College Database:

STUDENT (USN, SName, Address, Phone, Gender)
SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
SUBJECT (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

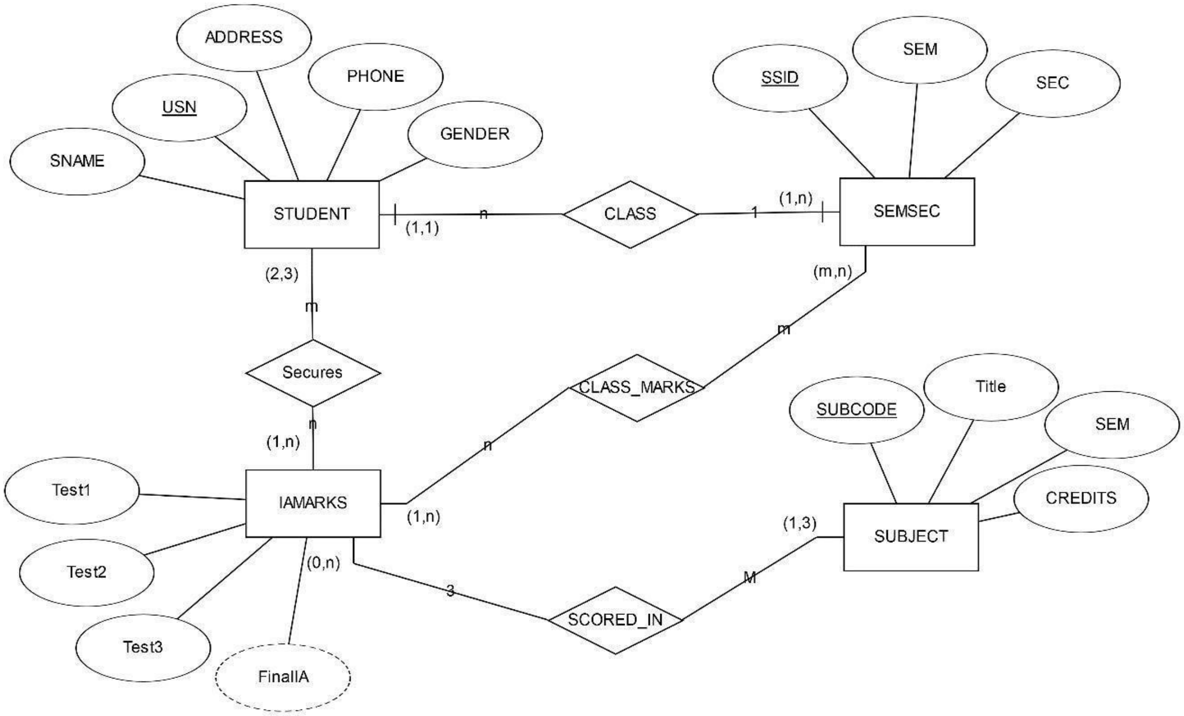
Write SQL queries to

1. List all the student details studying in fourth semester ‘C’ section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN ‘1BI15CS101’ in all subjects.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:

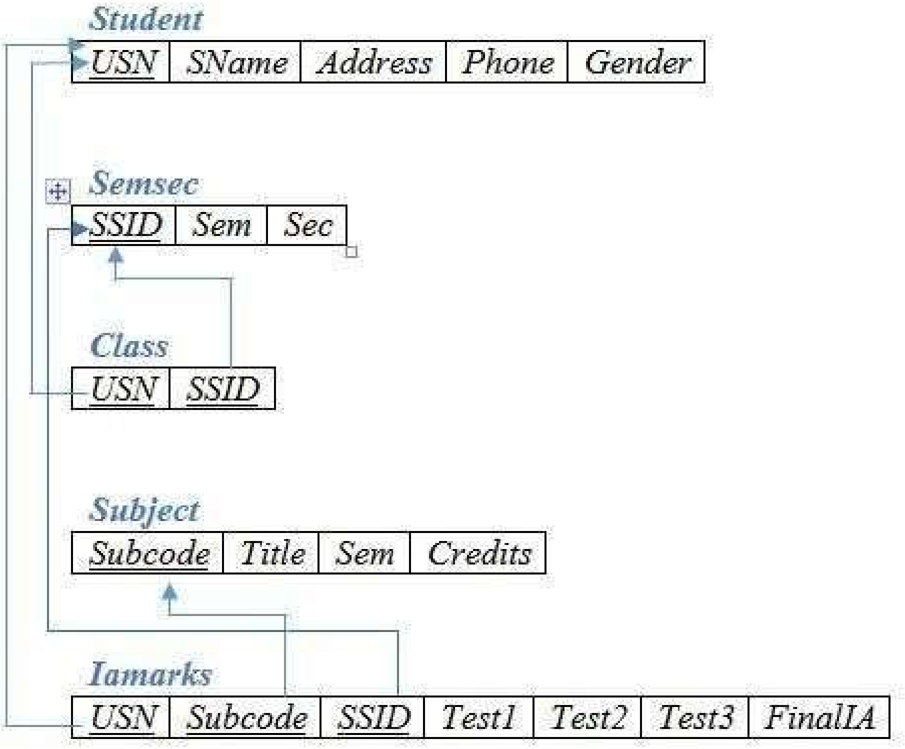
   If FinalIA = 17 to 20 then CAT = ‘Outstanding’
   If FinalIA = 12 to 16 then CAT = ‘Average’
   If FinalIA< 12 then CAT = ‘Weak’

Give these details only for 8th semester A, B, and C section students.

ER-Diagram:



SCHEMA:



Student

USN	SName	Address	Phone	Gender

Semsec

SSID	Sem	Sec

Class

USN	SSID

Subject

Subcode	Title	Sem	Credits

Iamarks

USN	Subcode	SSID	Test1	Test2	Test3	FinalIA

Table Creation:

STUDENT

```
CREATE TABLE STUDENT
(USN VARCHAR(10) PRIMARY KEY,
SNAME VARCHAR(25),
ADDRESS VARCHAR(25),
PHONE VARCHAR(10),
GENDER CHAR(1));

Table created.
```

SEMSEC

```
CREATE TABLE SEMSEC
SSID VARCHAR(5) PRIMARY KEY,
SEM NUMBER(2),
SEC CHAR(1));

Table created.
```

CLASS

```
CREATE TABLE CLASS
(USN VARCHAR(10),
  SSID VARCHAR(5),
  PRIMARYKEY(USN,SSID),
  FOREIGN KEY(USN) REFERENCES STUDENT(USN),
  FOREIGN KEY(SSID) REFERENCES SEMSEC(SSID));

Table created.
```

SUBJECT

```
CREATE TABLE SUBJECT
(SUBCODE VARCHAR2 (8) PRIMARY
  KEY,TITLE VARCHAR2 (20),
  SEM NUMBER (2),
  CREDITS NUMBER (2));

Table created.
```

IAMARKS

```
CREATE TABLE IAMARKS (
USN VARCHAR(10),
SUBCODE VARCHAR(8),
SSID VARCHAR(5),
TEST1NUMBER(2),
TEST2 NUMBER(2),
TEST3 NUMBER (2),
FINALIA NUMBER (3),
PRIMARY KEY (USN, SUBCODE, SSID),
FOREIGN KEY(USN) REFERENCES   STUDENT(USN),
FOREIGN KEY(SUBCODE) REFERENCES SUBJECT(SUBCODE),
FOREIGN KEY(SSID) REFERENCES SEMSEC(SSID));

Table created.
```

Values for tables:

STUDENT:

```
INSERT INTO STUDENT VALUES ('&USN',' &sname', '&address', ‘&phone’, '&gender');
```

SQL> select * from student;

```
USN          SNAME                ADDRESS                  PHONE       G
--------------------------------------------------------------------------
1cg15cs001 Abhi                   tumkur                   9875698410  M
1cg15cs002 amulya                 gubbi                    8896557412  F
1cg16me063 chethan                nittur                   7894759522  M
```

```
1cg14ec055 raghavi          sspuram            9485675521    F
1cg15ee065 sanjay           bangalore          9538444404    M
```

SEMSEC:

```
INSERT INTO SEMSEC VALUES     ('&SSID', ‘&sem’,'&sec');
```

select * from semsec;

```
SSID          SEM S
                  -
5A              5A
3B              3B
7A              7A
2C              2C
4B              4B
4c              4c
```

CLASS:

```
INSERT INTO CLASS VALUES     (‘&USN’,’&SSID’);
```

select * from class;

```
USN             SSID
--------------------------------------------------
1cg15cs001        5A
1cg15cs002        5A
1cg16me063        3B
1cg14ec055        7A
1cg15ee065        3B
1cg15ee065        4c
1cg15cs002        4c
```

SUBJECT:

```
INSERT INTO SUBJECT VALUES     ('10CS81','ACA',          8, 4);
```

select * from subject;

```
SUBCODE   TITLE                               SEM   CREDITS
--------------------------------       -----------   -------
15cs53      dbms                                5          4
15cs33      ds                                  3          4
15cs34      co                                  3          4
15csl58    dba                                 52
10cs71      oomd                                7          4
```

IAMARKS:

```
INSERT INTO IAMARKS VALUES
            (‘&USN’, ‘&SUBCODE’,’&SSID’, ’&TEST1’, ’&TEST2’, ’&TEST3’);

select * from iamarks;
```

```
USN           SUBCODE   SSID         TEST1       TEST2       TEST3     FINALIA
------------  --------- -------  -----------   ---------------------------------

1cg15cs001    15cs53    5A              18          19          15          19
1cg15cs002    15cs53    5A              15          16          14          16
1cg16me063    15cs33    3B              10          15          16          16
1cg14ec055    10cs71    7A              18          20          21          21
1cg15ee065    15cs33    3B              16          20          17          19
1cg15ee065    15cs53    4c              19          20          18          20
```

Queries:

1. List all the student details studying in fourth semester ‘C’ section.

VARIENT-1:

```
       select s.usn, sname, address, phone, gender
       from student s, class c, semsec ss
       where sem=4 and sec='c' and  s.ssid=c.ssid andc.usn=s.usn;
```

VARIANT-2

```
       select s.usn, sname, address, phone, gender
       from student s, class c, semsec ss
       where sem=4 and sec LIKE '%c' and ss.ssid=c.ssid and
       c.usn=s.usn;
```

VARIANT-3

```
       select s.usn, sname, address, phone, gender
       from student as s, class as c, semsec ss
       where sem =4 and sec LIKE '%c' and ss.ssid=c.ssid and
       c.usn=s.usn;
```

output

```
  USN        SNAME          ADDRESS          PHONE        G
  ---------- -------------- ---------------- ------------ -
  1cg15ee065 Sanjay         bangalore        9538444404   M
  1cg15cs002 Amulya         gubbi            8896557412   F
```

2. Compute the total number of male and female students in each semester and in each section.

```
Variant-1
SELECT SEM,SEC,GENDER,COUNT(*)
FROM STUDENT S, SEMSEC SS,CLASS C
WHERE S.USN=C.USN AND C.SSID=SS.SSID
GROUP BY SEM,SEC,GENDER
ORDER BY SEM;

Variant-2
SELECT SEM,SEC,GENDER,COUNT(*)
FROM STUDENT S, SEMSEC SS,CLASS C
WHERE S.USN=C.USN AND C.SSID=SS.SSID
GROUP BY SEM,SEC,GENDER
ORDER BY SEM ASC;

Variant-3
SELECT SEM,SEC,GENDER,COUNT(*)
FROM STUDENT as S, SEMSEC as SS,CLASS C
WHERE S.USN=C.USN AND C.SSID=SS.SSID
GROUP BY SEM,SEC,GENDER
ORDER BY SEM ASC;

OUTPUT:
    SEM S G  COUNT(*)
        - -
  ------------- ---------------------
        3 B M          2
        4 c F          1
        4 c M          1
        5 A F          1
        5 A M          1
        7 A F          1
```

3. Create a view of Test1 marks of student USN ‘1BI15CS101’ in all subjects.

```
Variant-1
CREATE   VIEW   TEST1   AS
SELECT SUBCODE, TEST1
FROM IAMARKS
WHERE USN='1cg15ee065';

View created.
```

Variant-2

```
        CREATE VIEW TEST1 AS
        SELECT SUBCODE, TEST1
        FROM IAMARKS
         WHERE USN LIKE '1cg15ee065';
View created.
```

Variant-3

```
        CREATE VIEW TEST1 AS
        SELECT SUBCODE, TEST1
        FROM IAMARKS
        WHERE USN = '1cg15ee065';
        Order by TEST1;
View created.

SQL> select * from test1;

        SUBCODE      TEST1
        --------------  -----------
        15cs33         16
        15cs53         19
```

4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.

```
CREATE OR REPLACE PROCEDURE AVG IS
CURSOR C_IAMARKS IS
SELECT GREATEST(TEST1,TEST2) AS A, GREATEST(TEST1,TEST3) AS B,
        GREATEST(TEST3,TEST2) AS C
FROM IAMARKS
WHERE FINALIA IS NULL

FOR UPDATE;
C_A NUMBER;
C_B NUMBER;
C_C NUMBER;
C_SM UMBER;C_AV NUMBER;
BEGIN
OPEN C_IAMARKS; LOOP
FETCH C_IAMARKS INTO C_A, C_B, C_C; EXIT WHEN C_IAMARKS%NOTFOUND;
DBMS_OUTPUT.PUT_LINE(C_A||' '||C_B||' '||C_C); IF(C_A!=C_B) THEN
C_SM:=C_A+C_B; ELSE
C_SM:=C_A+C_C; END IF; C_AV:=C_SM/2;
DBMS_OUTPUT.PUT_LINE('SUM='||C_SM);
DBMS_OUTPUT.PUT_LINE('AVERAGE='||C_AV); UPDATE IAMARKS
SET FINALIA=C_AV
WHERE CURRENT OF C_IAMARKS; END LOOP;
```

```
CLOSE C_IAMARKS; END AVG;

Procedure created.

SQL> BEGIN
  2   AVG;
  3   END;

PL/SQL procedure successfully completed.

SQL> SELECT * FROM IAMARKS;

USN           SUBCODE    SSID   TEST1     TEST2     TEST3     FINALIA
-------------------------------------------- ------------ ------------------


  1cg15cs001  15cs53     5A     18        19        15        19
  1cg15cs002  15cs53     5A     15        16        14        16
  1cg16me063  15cs33     3B     10        15        16        16
  1cg14ec055  10cs71     7A     18        20        21        21
  1cg15ee065  15cs33     3B     16        20        17        19
  1cg15ee065  15cs53     4c     19        20        18        20

6 rows selected.
```

5. Categorize students based on the following criterion:
If FinalIA = 17 to 20 then CAT = 'Outstanding' If
FinalIA = 12 to 16 then CAT = 'Average'
If FinalIA< 12 then CAT = 'Weak'
Give these details only for 8th semester A, B, and C section students.

```
SQL>  SELECT S.USN, S.SNAME, S.ADDRESS, S.PHONE, S.GENDER,
       CASE
             WHEN IA.FINALIA BETWEEN 17 AND 20 THEN 'OUTSTANDING'
             WHEN IA.FINALIA BETWEEN 12 AND 16 THEN 'AVERAGE'
              ELSE 'WEAK'
      END AS CAT
      FROM STUDENT S,SEMSEC SS,IAMARKS IA,SUBJECT SUB
      WHERE S.USN=IA.USN AND SS.SSID=IA.SSID AND
              SUB.SUBCODE=IA.SUBCODE AND SUB.SEM=7

        USN          SNAME          ADDRESS          PHONE         G CAT
        ------------ -------------- ---------------- ------------- - ---------
        1cg14ec055   raghavi        sspuram          9485675521    F WEAK
```

CHAPTER – 6

COMPANY DATABASE

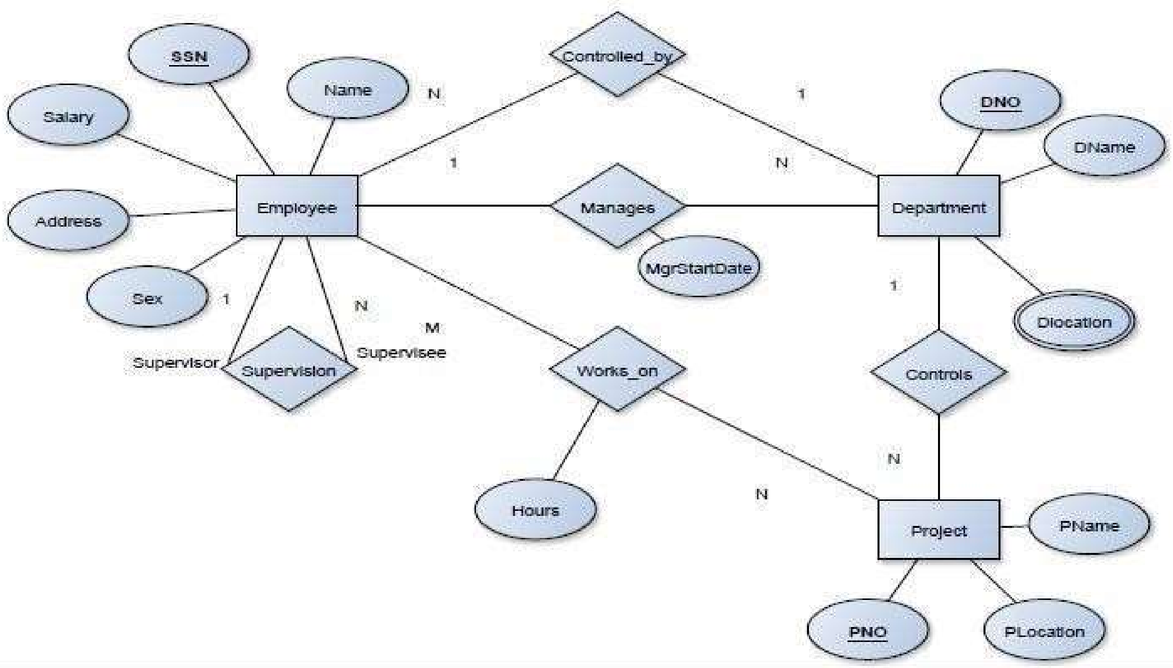
5). Consider the schema for Company Database:

EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN,DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo,DLoc)
PROJECT (PNo, PName, PLocation,
DNo) WORKS_ON (SSN, PNo, Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is ‘Scott’, either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the ‘IoT’ project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the ‘Accounts’ department, as well as the maximum salary, the minimum salary, and the average salary in this department
4. Retrieve the name of each employee who works on all the projects controlled bydepartment number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

ER-Diagram:



SCHEMA:

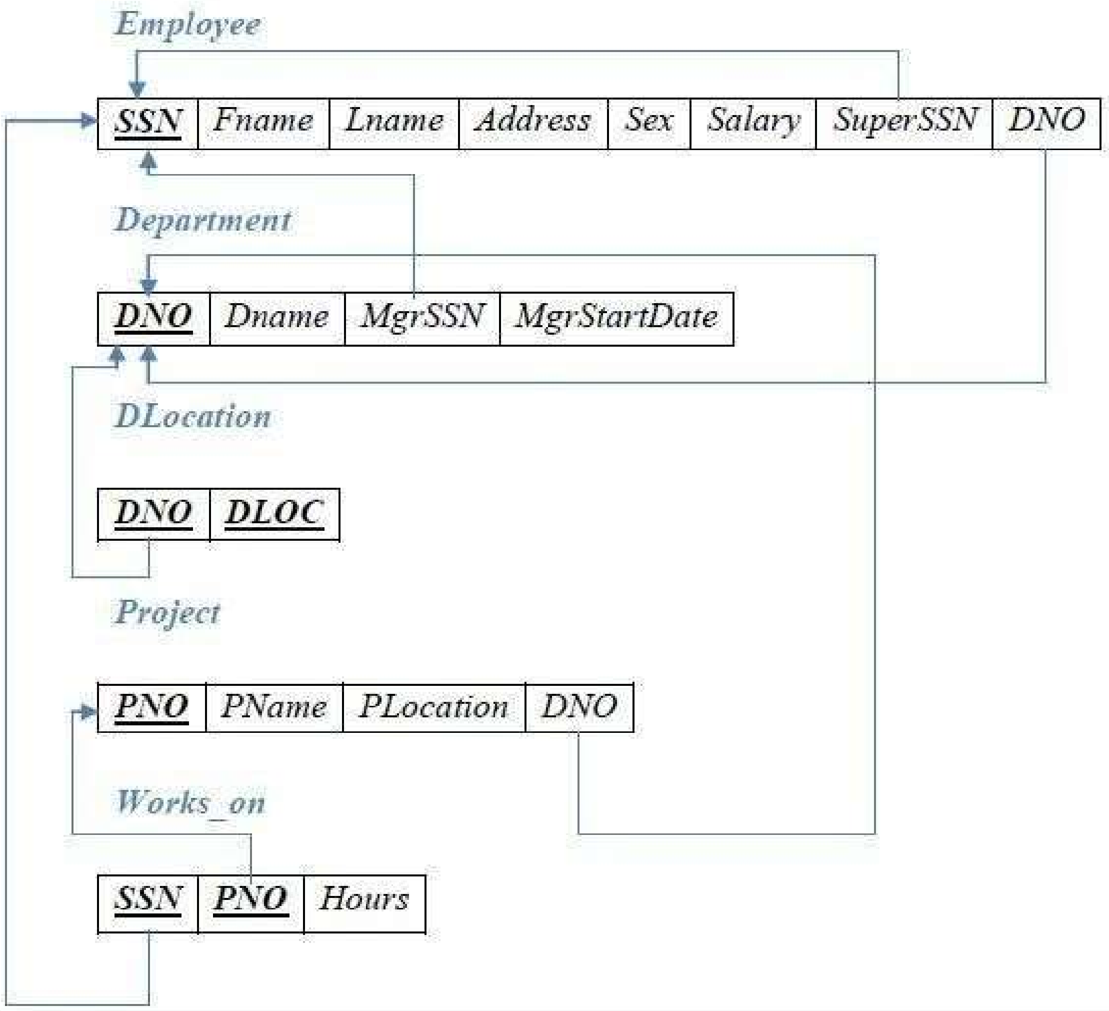

Employee
SSN
Fname
Lname
Address
Sex
Salary
SuperSSN
DNO
Department
DNO
Dname
MgrSSN
MgrStartDate
DLocation
DNO
DLOC
Project
PNO
PName
PLocation
DNO
Works_on
SSN
PNO
Hours

Table Creation:

DEPARTMENT

```
CREATE TABLE DEPARTMENT(
DNO NUMBER(3) CONSTRAINT DEPT_DNO_PK PRIMARY KEY, DNAME
VARCHAR(15) CONSTRAINT DEPT_DNAME_NN NOT NULL, MGRSSN
CHAR(10),
MGRSTARTDATE DATE);
```

EMPLOYEE

```
CREATE TABLE EMPLOYEE(
SSN CHAR(10) CONSTRAINT EMP_SSN_PK PRIMARY KEY,
NAME VARCHAR(18) CONSTRAINT EMP_NAME_NN NOT NULL,
ADDRESS VARCHAR(18),
SEX VARCHAR(3), SALARY
REAL, SUPER_SSN
CHAR(10),
DNO NUMBER(3) CONSTRAINT EMP_DNO_FK REFERENCES DEPARTMENT(DNO));
```

```
ALTER TABLE DEPARTMENT ADD CONSTRAINT DEPT_MGRSSN_FK FOREIGN
KEY(MGRSSN) REFERENCES EMPLOYEE(SSN);
```

```
Table altered.
```

DLOCATION

```
CREATE TABLE DLOCATION(
DLOC VARCHAR2 (20),
DNO REFERENCES DEPARTMENT (DNO),
PRIMARY KEY (DNO, DLOC));
```

PROJECT

```
CREATE TABLE PROJECT(
PNO INTEGER PRIMARY KEY,
PNAME VARCHAR2 (20),
PLOCATION VARCHAR2 (20),
DNO REFERENCES DEPARTMENT (DNO));
```

WORKS_ON

```
CREATE TABLE
WORKS_ON(HOURS
NUMBER (2),
SSN REFERENCES EMPLOYEE (SSN),
PNO REFERENCES PROJECT(PNO),
PRIMARY KEY (SSN, PNO));
```

Values for tables:

DEPARTMENT

```
INSERT INTO DEPARTMENT VALUES(&DNO,'&DNAME',&MGRSSN,'&MGRSTARTDATE');
```

```
SELECT * FROM DEPARTMENT;
```

```
          DNO DNAME                   MGRSSN        MGRSTARTD
------------- ----------------------- ------------- - ----------- -
            1 RESEARCH                111111        10-AUG-12
            2 ACCOUNTS                222222        10-AUG-10
              3AI                       333333        15-APR-12
            4 NETWORKS                111111        18-MAY-14
            5 BIGDATA                 666666        21-JAN-10
```

5 rows selected.

EMPLOYEE

```
INSERT INTO EMPLOYEE
VALUES('&SSN','&NAME','&ADDRESS','&SEX',&SALARY,'&SUPERSSN',&DNO);
```

```
SELECT * FROM EMPLOYEE;
```

```
SSN       NAME              ADDRESS             SE   SALARYSUPERSSN     DNO
                            ----------------    X
--------- ----------------                      ---- -------- --------- -----
---------                   ----------------                            -----
111111    RAJ               BENGALURU           M    700000               1
222222    RASHMI            MYSORE              F    400000111111         2
333333    RAGAVI            TUMKUR              F    800000               3
444444    RAJESH            TUMKUR              M    650000333333         3
555555    RAVEESH           BENGALURU           M    500000333333         3
666666    SCOTT             ENGLAND             M    700000444444         5
777777    NIGANTH           GUBBI               M    200000222222         2
888888    RAMYA             GUBBI               F    400000222222         3
999999    VIDYA             TUMKUR              F    650000333333         3
100000    GEETHA            TUMKUR              F    800000               3
```

10 rows selected.

DLOCATION

```
INSERT INTO DLOCATION VALUES(&DNO,'&DLOC');
```

```
SELECT * FROM DLOCATION;
```

```
          DNO   DLOC
  ------------- ---------------------
            1 MYSORE
            1  TUMKUR
            2  BENGALURU
```

```
                 3  GUBBI
                 4  DELHI
                 5  BENGALURU

        6   rows selected.
```

PROJECT

```
INSERT INTO PROJECT VALUES(&PNO,'&PNAME','&PLOCATION',’&DNO’);
```

```
  SELECT * FROM PROJECT;

                PNOPNAME            PLOCATION              DNO
                                    ----------------------  --------------------
                111IOT              GUBBI                        3

 222 TEXTSPEECH   GUBBI                              3
 333 IPSECURITY   DELHI                              4
 444 TRAFICANAL    BENGALURU                         5
 555 CLOUDSEC          DELHI                         1

      5 rows selected.
```

WORKS_ON

```
INSERT INTO WORKS_ON VALUES('&SSN',&PNO,&HOURS);
```

```
  SELECT * FROM    WORKS_ON
                                   ;
      SSN                                      HOURS
                                PNO
 ---------------------------------------  ----------------
      666666                    333             4

      666666                    111             2
      111111                    222             3
      555555                    222             2
      333333                    111             4
      444444                    111             6
      222222                    111             2

8 rows selected.
```

1. Make a list of all project numbers for projects that involve an employee whose lastname is ‘Scott’, either as a worker or as a manager of the department that controls the project.

Variant-1

```
(SELECT DISTINCT PNO
   FROM PROJECT P, DEPARTMENT, D.EMPLOYEE E
    WHEREP.DNO=D.DNO AND
           SSN=MGRSSNANDNAME='SCOTT')
  UNION
(SELECT DISTINCT P.PNO
  FROM PROJECT P, WORKS_ON W, EMPLOYEE E
  WHEREP.PNO=W.PNO AND W.SSN=E.SSN AND NAME='SCOTT');
```

Variant-2

```
(SELECT DISTINCT PNO
   FROM PROJECT P, DEPARTMENT D, EMPLOYEE E
    WHEREP.DNO=D.DNO AND SSN=MGRSSN AND NAME='SCOTT')
  EXIST
(SELECT DISTINCT P.PNO
  FROM PROJECT P, WORKS_ON W, EMPLOYEE E
  WHEREP.PNO=W.PNO AND W.SSN=E.SSN AND NAME='SCOTT');
```

Variant-3

```
SELECT DISTINCT P.PNO
FROM PROJECT P, DEPARTMENT D, EMPLOYEE E
WHERE E.DNO=D.DNO AND D.DNO=P.DNO AND
(E.LNAME=’SCOTT’ OR
                      D.MGR_SS IN
                                  (SELECT SSN  FROM EMPLOYEE
                                  WHERE LNAME=’SCOTT’));
```

```
      PN
----------------------
      O11

      1
      333
      444
```

2. Show the resulting salaries if every employee working on the ‘IoT’project is given a10 percent raise.

Variant-1

```
SELECT FNAME, LNAME, 1.1*SALARY AS INCR_SAL
FROM EMPLOYEE E, WORKS_ON W, PROJECT P
        WHERE E.SSN=W.SSN
         ANDW.PNO=P.PNO
         ANDP.PNAME=’IOT’;
```

Variant-2

```
SELECT E.SNN, E.FNAME, SUM(E.SALARY
+(E.SALARY*0.1)  AS HIKE_10_PER
 FROM EMPLOYEE E, DEPARTMENT D
        WHERE E.DNO=D.DNO
         AND D.DNAME=’IOT’
        GROUP BY SNN, FNAME;
```

Variant-3

```
SELECT FNAME, LNAME, 1.1*SALARY AS INCR_SAL
FROM EMPLOYEE E
        WHERE E.SSN
        IN (SELECT SSN
             FROM WORKS_ON W, PROJECT P
             WHERE W.SSN ANDW.PNO=P.PNO
         ANDP.PNAME=’IOT’;
```

```
SSN          NAME                ADDRESS              SEX    SALARYSUPERSSN          DNO
-----------  ------------------  -------------------  ----  --------------------  ----------
111111       RAJ                 BENGALURU            M      700000                    1
222222       RASHMI              MYSORE               F      440000111111              2
333333       RAGAVI              TUMKUR               F      880000                    3
444444       RAJESH              TUMKUR               M      715000333333              3
555555       RAVEESH             BENGALURU            M      500000333333              3
666666       SCOTT               ENGLAND              M      770000444444              5
777777       NIGANTH             GUBBI                M      200000222222              2
888888       RAMYA               GUBBI                F      400000222222              3
999999       VIDYA               TUMKUR               F      650000333333              3
100000       GEETHA              TUMKUR               F      800000                    3

10rowsselected.
```

3. Find the sum of the salaries of all employees of the ‘Accounts’ department, as well as the maximum salary, the minimum salary, and the average salary in this department.

Variant-1

```
SELECT SUM(SALARY),MAX(SALARY),MIN(SALARY), AVG(SALARY)

FROM EMPLOYEE E,DEPARTMENT D
WHERE DNAME='ACCOUNTS' AND D.DNO=E.DNO;
```

Variant-2

```
SELECT SUM(SALARY) AS SUM_SALARY,

MAX(SALARY) AS MAX_SALARY,

MIN(SALARY) AS MIN_SALARY,

AVG(SALARY) AS AVG_SALARY

FROM EMPLOYEE E, DEPARTMENT D
WHERE E.DN=D.DNO AND D.DNAME='ACCOUNTS';
```

Variant-3

```
SELECT SUM(SALARY),MAX(SALARY),MIN(SALARY), AVG(SALARY)

FROM EMPLOYEE E,DEPARTMENT D
WHERE DNAME='ACCOUNTS' AND D.DNO=E.DNO;
```

```
SUM (SALARY)MAX(SALARY)MIN(SALARY)AVG(SALARY)
                --------------------  --------------------  --------------------
                                   -                     -                     -
                              440000                200000                320000
```

4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOTEXISTS operator).

Variant-1

```
SELECTNAMEFROM
EMPLOYEEE

WHERE NOT EXISTS((SELECTPNO
                  FROM PROJECT
                  WHEREDNO=5)MINUS(SELECT
```

```
                                  PNO
                                      FROM WORKS_ON
                                      WWHEREE.SSN=W.SSN));
```

Variant-2

```
SELECTNAMEFROM
EMPLOYEEE
WHERE NOT EXISTS((SELECTPNO
                                   FROM
                                  ROJECTWHER
                                  EDNO=5)
                                  NOT EXISTS(SELECTPNO
                                      FROM WORKS_ON
                                      WWHEREE.SSN=W.SSN));
```

Variant-3

```
SELECTNAMEFROM
EMPLOYEEE
WHERE NOT EXISTS((SELECTPNO
                                  FROM ROJECTWHEREDNO=5)
                                  MINUS (SELECTPNO
                                      FROM WORKS_ON
                                      WWHEREE.SSN=W.SSN)
                                      )
```

```
NAME
----------------------------------------
SCOTT
```

5. For each department that has more than five employees, retrieve the department number And the number of its employees who are making more than Rs.6,00,000.

Variant-1

```
SELECT      DNO, COUNT(SSN)
  FROM EMPLOYEE
WHERE SALARY>600000 AND DNO IN (SELECTDNO
                                      FROM    EMPLOYEE
                                      GROUPBYDNO
                              HAVING COUNT(SSN)>5)
GROUPBY DNO;
```

Variant-2

```
SELECT DNO, COUNT(*) AS NO-OF-EMP
FROM EMPLOYE E, DEPARTMENT D
WHERE E.DNO= D.DNO AND E.SALARY>600000 AND
          DNO IN  (SELECT E1.DNO
                      FROM  EMPLOYEE E1
                      GROUP BY E1.DNO
                      HAVING COUNT(*)>5)
GROUPBY DNO;
```

Variant-3

```
SELECT DNO,COUNT(SSN)
FROM EMPLOYEE E
WHERE SALARY>600000 AND DNO EXISTS (SELECT
          DNO
                      FROM EMPLOYEE E
                       GROUPBYDNO
                      HAVING COUNT(SSN)>5)
                      GROUPBY DNO;
```

```
          DNOCOUNT(SSN)
----------------------  -------------------------
              3                  4
```

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3. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.

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VIVA QUESTIONS

1. Define Data.
2. Define Information.
3. Define Database.
4. Define DBMS.
5. What do you mean by processed data?
6. What do you mean by data management?
7. Which are the actions that are performed on the database?
8. Mention the different types of DBMS.
9. Define Data model.
10. Mention the different types of Data models.
11. Why database approach is advantageous than the file system approach?
12. Who is called as the father of RDBMS?
13. What do you mean by redundant data?
14. What do you mean by Data duplication?
15. Mention the different relational algebra operations.
16. Mention the different User interfaces provided by the database system.
17. Mention the different languages provided by the database system
18. What is the difference between select operation in relational algebra and in SQL?
19. What is the difference between JOIN and Cartesian product?
20. Mention the different types of Join operations.
21. What is the difference between EQUIJOIN and NATURAL JOIN?
22. What is the difference between OUTER JOIN and JOIN.?
23. What is the difference between OUTER UNION and UNION?
24. What do you mean by Union Compatibility.?
25. What do you mean by Type Compatibility?
26. Mention the different types of relational constraints.
27. Mention the different types of structural constraints
28. What do you mean by cardinality?
29. What do you mean by cardinality ratio?
30. What do you mean by degree of a relation?
31. What do you mean by entity integrity constraint?
32. What do you mean by referential integrity constraint?
33. What do you mean by NULL constraint?
34. What do you mean by unique constraint?
35. What do you mean by Check constraint?
36. Define functional dependency.
37. Define normalization.
38. Define normal form
39. Mention the different types of normal forms
40. What is the difference between 3NF and BCNF?
41. What do you mean by JOIN dependencies?
42. What do you mean by Inclusion dependencies?
43. What do you mean by Template dependencies?
44. What do you mean by Multivalued dependencies?
45. Define Project Join Normal form.

46. Define Domain Key Normal form.
47. Mention the informal guidelines for database design.
48. Define super key.
49. Define primary key.
50. Define foreign key.
51. Define unique key.
52. Define prime attribute.
53. Define trivial functional dependency.
54. When a FD is said to be fully FD?
55. Mention the different Armstrong’s inference rules.
56. Why Armstrong’s inference rules are said to be sound and complete?
57. Define denormalisation.
58. Define Transaction.
59. Mention the ACID properties.
60. Define schedule.
61. Is DBMS usage always advisable or some times we may depend on file base systems? Comment on the statement by describing the situation where DBMS is not a better option & file base systems is better.
62. Describe 3-level architecture of DBMS with details of languages associated at different levels plus the level of data independence.
63. How logical architecture of DBMS differs from physical architecture?
64. Create an E R diagram and relational schema to hold information about the situation in many institutions affiliated to some University, many teachers of different disciplines are teaching to many students enrolled in many courses offered by the university to the students through the institutions. Use concept of keys, aggregation, generalisation, cardinality etc. in a proper way.
65. What is the utility of relational algebra & relational calculus? Name some software’s based on these concepts?
66. Comment on the statement “Set theory has contributed a lot to RDBMS” support it with the help of suitable examples.
67. “Redundancy of data is many times beneficial” Justify the statement, also describe the situation when redundancy will mess up the current data base status, at that instance of time what actions you will prefer to take.
68. In Oracle we are having variety of versions Oracle 8, Oracle 9, etc, what does the associated number mean. Again we are having Oracle 8i, Oracle 9i etc, what does this “i” mean.
69. Describe the various file organization techniques? How a binary tree is different from B-tree and B+ tree? Under which situation we need to use B+ tree or B tree. Prove “Any relation which is in BCNF is in 3NF,but converse is not true”
70. Which functional dependencies are to be removed to achieve respective normal form? Discuss all the normal forms up to 4NF?
71. What is the mathematical basis of SQL? The SQL statement: select * from student will perform like projection or selection? Give details in support of your answer.