# EAST WEST INSTITUTE OF TECHNOLOGY

## DEPARTMENT OF INFORMATION SCIENCE & ENGG.

# LABORATORY MANUAL

## DATABASE MANAGEMENT SYSTEM LABORATORY

## (18CSL58)

## V SEMESTER

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**DBMS LABORATORY WITH MINI PROJECT**
**(Effective from the academic year 2018 -2019)**
**SEMESTER – V**

| | | | |
|---|---|---|---|
| Subject Code | 18CSL58 | CIE Marks | 40 |
| Number of Lecture Hours/Week | 0:2:2 | SEE Marks | 60 |
| Total Number of Lecture Hours | 36 | Exam Hours | 03 |

**CREDITS – 02**

**Course objectives:** This course will enable students to

- Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.

**Description (If any):**

**PART-A: SQL Programming (Max. Exam Mks. 50)**

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
- Create Schema and insert at least 5 records for each table. Add appropriate database constraints.

**PART-B: Mini Project (Max. Exam Mks. 30)**

- Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application (Mobile apps on Android/IOS are not permitted.)

**Lab Experiments:**

**Part A: SQL Programming**

**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, Branch_id, No-of_Copies)
BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date)
LIBRARY_BRANCH(Branch_id, Branch_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.

**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 salesman who had more than one customer.<br>3. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.)<br>4. Create a view that finds the salesman who has the customer with the highest order of a day.<br>5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted. |
| **3** | Consider the schema for Movie Database:<br>ACTOR(Act_id, Act_Name, Act_Gender)<br>DIRECTOR(Dir_id, Dir_Name, Dir_Phone)<br>MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)<br>MOVIE_CAST(Act_id, Mov_id, Role)<br>RATING(Mov_id, Rev_Stars)<br>Write SQL queries to<br>1. List the titles of all movies directed by 'Hitchcock'.<br>2. Find the movie names where one or more actors acted in two or more movies.<br>3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).<br>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.<br>5. Update rating of all movies directed by 'Steven Spielberg' to 5. |
| **4** | Consider the schema for College Database:<br>STUDENT(USN, SName, Address, Phone, Gender)<br>SEMSEC(SSID, Sem, Sec)<br>CLASS(USN, SSID)<br>SUBJECT(Subcode, Title, Sem, Credits)<br>IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)<br>Write SQL queries to<br>1. List all the student details studying in fourth semester 'C' section.<br>2. Compute the total number of male and female students in each semester and in each section.<br>3. Create a view of Test1 marks of student USN '1BI15CS101' in all subjects.<br>4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.<br>5. Categorize students based on the following criterion:<br>If FinalIA = 17 to 20 then CAT = 'Outstanding'<br>If FinalIA = 12 to 16 then CAT = 'Average'<br>If FinalIA< 12 then CAT = 'Weak'<br>Give these details only for 8th semester A, B, and C section students. |
| **5** | Consider the schema for Company Database:<br>EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)<br>DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate)<br>DLOCATION(DNo,DLoc)<br>PROJECT(PNo, PName, PLocation, DNo)<br>WORKS_ON(SSN, PNo, Hours)<br>Write SQL queries to<br>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.<br>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<br>4. Retrieve the name of each employee who works on all the projects controlledby department number 5 (use NOT EXISTS operator).<br>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. |

**Part B: Mini project**

- For any problem selected, write the ER Diagram, apply ER-mapping rules, normalize the relations, and follow the application development process.
- Make sure that the application should have five or more tables, at least one trigger and one stored procedure, using suitable frontend tool.
- Indicative areas include; health care, education, industry, transport, supply chain, etc.

**Course outcomes:** The students should be able to:

- Create, Update and query on the database.
- Demonstrate the working of different concepts of DBMS
- Implement, analyze and evaluate the project developed for an application.

**Conduction of Practical Examination:**

Experiment distribution

o For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

o For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.

 Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.

 Marks Distribution *(Courseed to change in accoradance with university regulations)*

k) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks

l) For laboratories having PART A and PART B

i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks

ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

1.

# INTRODUCTION TO SQL

## Introduction about SQL

**SQL (Structured Query Language)** is a nonprocedural language, you specify what you want, not how to get it. A block structured format of English key words is used in this Query language. It has the following components.

**DDL (Data Definition Language)-** The SQL DDL provides command for defining relation schemas, deleting relations and modifying relation schema.

**DML (DATA Manipulation Language)-** It includes commands to insert tuples into, delete tuples from and modify tuples in the database.

**View definition**-The SQL DDL includes commands for defining views. Transaction Control- SQL includes for specifying the beginning and ending of transactions.

**Embedded SQL and Dynamic SQL**- Embedded and Dynamic SQL define how SQL statements can be embedded with in general purpose programming languages, such as C, C++, JAVA, COBOL, Pascal and Fortran.

**Integrity**-The SQL DDL includes commands for specifying integrity constraints that the data stored in the database must specify. Updates that violate integrity constraints are allowed.

**Authorization**-The SQL DDL includes commands for specifying access rights to relations and views.

## Data Definition Languages:

The SQL DDL allows specification of not only a set of relations but also information about each relation, including-

- Schema for each relation
- The domain of values associated with each attribute.
- The integrity constraints.
- The set of indices to be maintained for each relation.
- The security and authorization information for each relation.
- The physical storage structure of each relation on disk.

**Domain types in SQL-**

The SQL standard supports a variety of built in domain types, including-

- Char (n)- A fixed length character length string with user specified length .
- Varchar (n)- A variable character length string with user specified maximum length n.
- Int- An integer.
- Small integer- A small integer.
- Numeric (p, d)-A Fixed point number with user defined precision.
- Real, double precision- Floating point and double precision floating point numbers with machine dependent precision.
- Float (n)- A floating point number, with precision of at least n digits.
- Date- A calendar date containing a (four digit) year, month and day of the month.
- Time- The time of day, in hours, minutes and seconds Eg. Time'09:30:00'.
- Number- Number is used to store numbers (fixed or floating point).

**DDL statement for creating a table**

**Syntax-**

Create table tablename (columnname datatype(size), columnname datatype(size));

**Insertion of selected data into a table from another table:**

**Syntax-** INSERT INTO tablename SELECT columnname, columnname..... FROM tablename WHERE columnname= expression;

**Retrieving of data from the tables**

**Syntax-** SELECT * FROM tablename;

**The retrieving of specific columns from a table**

**Syntax-** SELECT columnname, columnname, …. FROM tablename;

**Elimination of duplicates from the select statement**

**Syntax-**SELECT DISTINCT columnname, columnname FROM tablename;

**Selecting a data set from table data**

**Syntax-** SELECT columnname, columnname FROM tablename WHERE searchcondition;

**Follow the below steps for creating a user in Oracle.**
**--Connect as System user**

**CREATE USER username IDENTIFIED BY apassword;**

**GRANT CONNECT TO username**;

## SIMPLE SQL QUERIES

Basic SQL queries correspond to using the following operations of the relational algebra: SELECT

PROJECT

JOIN

All subsequent examples uses COMPANY database as shown below:

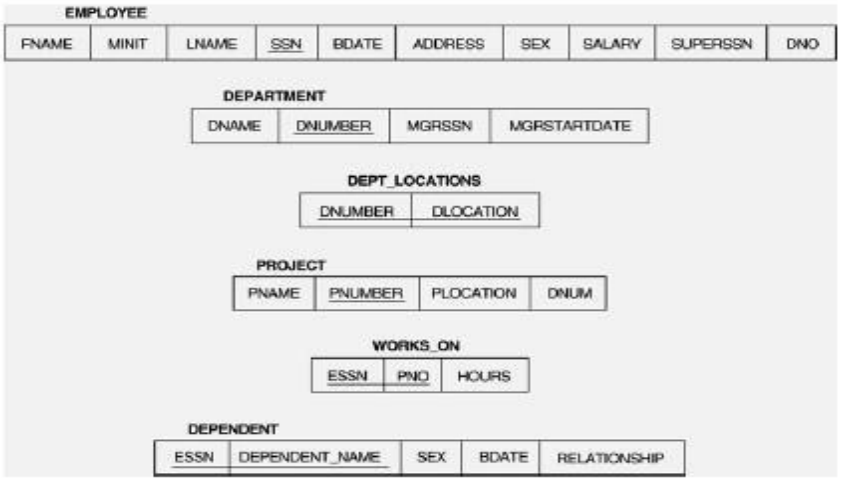
**Example of a simple query on one relation**

**Query 0: Retrieve the birth date and address of the employee whose name is 'John B. Smith'.**

Q0: SELECT BDATE, ADDRESS FROM EMPLOYEE

WHERE FNAME='John' AND MINIT='B' AND LNAME='Smith'

Similar to a SELECT-PROJECT pair of relational algebra operations: The SELECT-clause specifies the projection attributes and the WHERE-clause specifies the selection condition However, the result of the query may contain duplicate tuples



EMPLOYEE

| FNAME | MINIT | LNAME | SSN | BDATE | ADDRESS | SEX | SALARY | SUPERSSN | DNO |
|---|---|---|---|---|---|---|---|---|---|
| John | B | Smith | 123456789 | 1965-01-09 | 731 Fondren, Houston, TX | M | 30000 | 333445555 | 5 |
| Franklin | T | Wong | 333445555 | 1955-12-08 | 638 Voss, Houston, TX | M | 40000 | 888665555 | 5 |
| Alicia | J | Zelaya | 999887777 | 1968-07-19 | 3321 Castle, Spring, TX | F | 25000 | 987654321 | 4 |
| Jennifer | S | Wallace | 987654321 | 1941-06-20 | 291 Berry, Bellaire, TX | F | 43000 | 888665555 | 4 |
| Ramesh | K | Narayan | 666884444 | 1962-09-15 | 975 Fire Oak, Humble, TX | M | 38000 | 333445555 | 5 |
| Joyce | A | English | 453453453 | 1972-07-31 | 5631 Rice, Houston, TX | F | 25000 | 333445555 | 5 |
| Ahmad | V | Jabbar | 987987987 | 1969-03-29 | 980 Dallas, Houston, TX | M | 25000 | 987654321 | 4 |
| James | E | Borg | 888665555 | 1937-11-10 | 450 Stone, Houston, TX | M | 55000 | null | 1 |

DEPT_LOCATIONS

| DNUMBER | DLOCATION |
|---|---|
| 1 | Houston |
| 4 | Stafford |
| 5 | Bellaire |
| 5 | Sugarland |
| 5 | Houston |

DEPARTMENT

| DNAME | DNUMBER | MGRSSN | MGRSTARTDATE |
|---|---|---|---|
| Research | 5 | 333445555 | 1988-05-22 |
| Administration | 4 | 987654321 | 1995-01-01 |
| Headquarters | 1 | 888665555 | 1981-06-19 |

WORKS_ON

| ESSN | PNO | HOURS |
|---|---|---|
| 123456789 | 1 | 32.5 |
| 123456789 | 2 | 7.5 |
| 666884444 | 3 | 40.0 |
| 453453453 | 1 | 20.0 |
| 453453453 | 2 | 20.0 |
| 333445555 | 2 | 10.0 |
| 333445555 | 3 | 10.0 |
| 333445555 | 10 | 10.0 |
| 333445555 | 20 | 10.0 |
| 999887777 | 30 | 30.0 |
| 999887777 | 10 | 10.0 |
| 987987987 | 10 | 35.0 |
| 987987987 | 30 | 5.0 |
| 987654321 | 30 | 20.0 |
| 987654321 | 20 | 15.0 |
| 888665555 | 20 | null |

PROJECT

| PNAME | PNUMBER | PLOCATION | DNUM |
|---|---|---|---|
| ProductX | 1 | Bellaire | 5 |
| ProductY | 2 | Sugarland | 5 |
| ProductZ | 3 | Houston | 5 |
| Computerization | 10 | Stafford | 4 |
| Reorganization | 20 | Houston | 1 |
| Newbenefits | 30 | Stafford | 4 |

DEPENDENT

| ESSN | DEPENDENT_NAME | SEX | BDATE | RELATIONSHIP |
|---|---|---|---|---|
| 333445555 | Alice | F | 1986-04-05 | DAUGHTER |
| 333445555 | Theodore | M | 1983-10-25 | SON |
| 333445555 | Joy | F | 1958-05-03 | SPOUSE |
| 987654321 | Abner | M | 1942-02-28 | SPOUSE |
| 123456789 | Michael | M | 1988-01-04 | SON |
| 123456789 | Alice | F | 1988-12-30 | DAUGHTER |
| 123456789 | Elizabeth | F | 1967-05-05 | SPOUSE |

**Example of a simple query on two relations**

**Query 1: Retrieve the name and address of all employees who work for the 'Research' department.**

Q1: SELECT FNAME, LNAME, ADDRESS FROM EMPLOYEE, DEPARTMENT WHERE DNAME='Research' AND DNUMBER=DNO

Similar to a SELECT-PROJECT-JOIN sequence of relational algebra operations (DNAME='Research') is a selection condition (corresponds to a SELECT operation in relational algebra) (DNUMBER=DNO) is a join condition (corresponds to a JOIN operation in relational algebra)

**Example of a simple query on three relations**

**Query 2: For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.**

Q2: SELECT PNUMBER, DNUM, LNAME, BDATE, ADDRESS FROM PROJECT, DEPARTMENT, EMPLOYEE WHERE DNUM=DNUMBER AND MGRSSN=SSN AND PLOCATION='Stafford'

In Q2, there are two join conditions The join condition DNUM=DNUMBER relates a project to its controlling department The join condition MGRSSN=SSN relates the controlling department to the employee who manages that department

**ALIASES, * AND DISTINCT, EMPTY WHERE-CLAUSE**

- In SQL, we can use the same name for two (or more) attributes as long as the attributes are in different relations
- A query that refers to two or more attributes with the same name must qualify the attribute name with the relation name by prefixing the relation name to the attribute name **Example:** EMPLOYEE.LNAME, DEPARTMENT.DNAME
- Some queries need to refer to the same relation twice. In this case, aliases are given to the relation name

**Example**

**Query 3: For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.**

Q3: SELECT E.FNAME, E.LNAME, S.FNAME, S.LNAME FROM EMPLOYEE E S WHERE E.SUPERSSN=S.SSN

In Q3, the alternate relation names E and S are called aliases or tuple variables for the EMPLOYEE relation we can think of E and S as two different copies of EMPLOYEE; E represents employees in role of supervisees and S represents employees in role of supervisors Aliasing can also be used in any SQL query for convenience. Can also use the AS keyword to specify aliases

Q3: SELECT E.FNAME, E.LNAME, S.FNAME, S.LNAME FRO EMPLOYEE AS E, EMPLOYEE AS S WHERE E.SUPERSSN=S.SSN

**UNSPECIFIED WHERE-clause**

A missing WHERE-clause indicates no condition; hence, all tuples of the relations in theFROM-clause are selected. This is equivalent to the condition WHERE TRUE

Example:

**Query 4: Retrieve the SSN values for all employees.**

Q4: SELECT SSN FROM EMPLOYEE

If more than one relation is specified in the FROM-clause and there is no join condition, then the CARTESIAN PRODUCT of tuples is selected

Example:

Q5: SELECT SSN, DNAME FROM EMPLOYEE, DEPARTMENT

**Note:** It is extremely important not to overlook specifying any selection and join conditions in the WHERE-clause; otherwise, incorrect and very large relations mayresult

**USE OF ***

To retrieve all the attribute values of the selected tuples, a * is used, which stands for all the attributes

Examples:

R**etrieve all the attribute values of EMPLOYEES who work in department 5.**

Q1a: SELECT * FROM EMPLOYEE WHERE DNO=5

**Retrieve all the attributes of an employee and attributes of DEPARTMENT he works in for every employee of 'Research' department.**

Q1b: SELECT * FROM EMPLOYEE, DEPARTMENT WHERE DNAME='Research' AND DNO=DNUMBER

**USE OF DISTINCT**

SQL does not treat a relation as a set; duplicate tuples can appear. To eliminate duplicate tuples in a query result, the keyword DISTINCT is used

Example: the result of **Q1c** may have duplicate SALARY values whereas **Q1d** does not have any duplicate values

Q1c: SELECT SALARY FROM EMPLOYEE Q1d: SELECT **DISTINCT** SALARY FROM EMPLOYEE

**SET OPERATIONS**

SQL has directly incorporated some set operations such as union operation (UNION), set difference (MINUS) and intersection (INTERSECT) operations. The resulting relations of these set operations are sets of tuples; duplicate tuples are eliminated from the result. The

Set operations apply only to union compatible relations; the two relations must have the same attributes and the attributes must appear in the same order

**Query 5: Make a list of all project numbers for projects that involve an employee whose last name is 'Smith' as a worker or as a manager of the department that controls the project.**

```
Q5: (SELECT PNAME FROM PROJECT, DEPARTMENT, EMPLOYEE
WHERE DNUM=DNUMBER AND MGRSSN=SSN AND LNAME='Smith')
UNION
(SELECT PNAME FROM PROJECT, WORKS_ON, EMPLOYEE
        WHERE PNUMBER=PNO AND ESSN=SSN AND NAME='Smith')
```

**NESTING OF QUERIES**

A complete SELECT query, called a nested query, can be specified within the WHERE- clause of another query, called the outer query. Many of the previous queries can be specified in an alternative form using nesting

**Query 6: Retrieve the name and address of all employees who work for the 'Research' department.**

```
Q6: SELECT FNAME, LNAME, ADDRESS FROM EMPLOYEE WHERE DNO IN
(SELECT DNUMBER FROM DEPARTMENT WHERE DNAME='Research')
```

**Note:** The nested query selects the number of the 'Research' department. The outer query selects an EMPLOYEE tuple if its DNO value is in the result of either nested query. The comparison operator IN compares a value v with a set (or multi-set) of values V, and evaluates to TRUE if v is one of the elements in V

In general, we can have several levels of nested queries. A reference to an unqualified attribute refers to the relation declared in the innermost nested query. In this example, the nested query is not correlated with the outer query

**CORRELATED NESTED QUERIES**

If a condition in the WHERE-clause of a nested query references an attribute of a relation declared in the outer query, the two queries are said to be correlated. The result of a correlated nested query is different for each tuple (or combination of tuples) of the relation(s) the outer query

**Query 7: Retrieve the name of each employee who has a dependent with the same first name as the employee**.

Q7: SELECT E.FNAME, E.LNAME FROM EMPLOYEE AS E WHERE E.SSN **IN** (SELECT ESSN FROM DEPENDENT WHERE ESSN=E.SSN AND E.FNAME=DEPENDENT_NAME)

In Q7, the nested query has a different result in the outer query. A query written with nested SELECT... FROM… WHERE... blocks and using the **= or IN** comparison operators can *always* be expressed as a single block query. For example, Q7 may be written as in Q7a

Q7a: SELECT E.FNAME, E.LNAME FROM EMPLOYEE E, DEPENDENT D WHERE E.SSN=D.ESSN AND E.FNAME=D.DEPENDENT_NAME

**THE EXISTS FUNCTION**

EXISTS is used to check whether the result of a correlated nested query is empty (contains no tuples) or not. We can formulate Query 7 in an alternative form that uses EXIST.

Q7b: SELECT FNAME, LNAME FROM EMPLOYEE
WHERE **EXISTS** (SELECT * FROM DEPENDENT WHERE SSN=ESSN AND FNAME=DEPENDENT_NAME)

**Query 8: Retrieve the names of employees who have no dependents**.

Q8: SELECT FNAME, LNAME FROM
EMPLOYEE WHERE **NOT EXISTS**
(SELECT * FROM DEPENDENT WHERE SSN=ESSN)

**Note:** In Q8, the correlated nested query retrieves all DEPENDENT tuples related to an EMPLOYEE tuple. If none exist, the EMPLOYEE tuple is selected

**EXPLICIT SETS**

It is also possible to use an explicit (enumerated) set of values in the WHERE-clause rather than a nested query

**Query 9: Retrieve the social security numbers of all employees who work on project number 1, 2, or 3.**

Q9: SELECT DISTINCT ESSN FROM WORKS_ON WHERE PNO **IN (1, 2, 3)**

## NULLS IN SQL QUERIES

SQL allows queries that check if a value is NULL (missing or undefined or not applicable). SQL uses IS or IS NOT to compare NULLs because it considers each NULL value distinct from other NULL values, so equality comparison is not appropriate.

**Query 10: Retrieve the names of all employees who do not have supervisors.**

```
Q10: SELECT FNAME, LNAME FROM EMPLOYEE
WHERE SUPERSSN IS NULL
```

**Note:** If a join condition is specified, tuples with NULL values for the join attributes are not included in the result

## AGGREGATE FUNCTIONS

Include COUNT, SUM, MAX, MIN, and AVG

**Query 11: Find the maximum salary, the minimum salary, and the average salary among all employees.**

```
Q11: SELECT MAX (SALARY), MIN(SALARY), AVG(SALARY)
FROM EMPLOYEE
```

**Note:** Some SQL implementations may not allow more than one function in the SELECT-clause

**Query 12: Find the maximum salary, the minimum salary, and the average salary among employees who work for the 'Research' department.**

```
Q12: SELECT MAX (SALARY), MIN(SALARY), AVG(SALARY) FROM
EMPLOYEE, DEPARTMENT WHERE DNO=DNUMBER AND DNAME='Research'
```

**Queries 13 and 14: Retrieve the total number of employees in the company (Q13), and the number of employees in the 'Research' department (Q14).**

```
Q13: SELECT COUNT (*) FROM EMPLOYEE
Q14: SELECT COUNT (*) FROM EMPLOYEE, DEPARTMENT
WHERE DNO=DNUMBER AND DNAME='Research'
```

## GROUPING

- In many cases, we want to apply the aggregate functions to subgroups of tuples in a relation
- Each subgroup of tuples consists of the set of tuples that have the same value for the grouping attribute(s)

- The function is applied to each subgroup independently
- SQL has a GROUP BY-clause for specifying the grouping attributes, which must also appear in the SELECT-clause

**Query 15: For each department, retrieve the department number, the number of employees in the department, and their average salary.**

```
Q15: SELECT DNO, COUNT (*), AVG (SALARY)
FROM EMPLOYEE GROUP BY DNO
```

- In Q15, the EMPLOYEE tuples are divided into groups. Each group having the same value for the grouping attribute DNO
- The COUNT and AVG functions are applied to each such group of tuples separately
- The SELECT-clause includes only the grouping attribute and the functions to be applied on each group of tuples
- A join condition can be used in conjunction with grouping

**Query 16: For each project, retrieve the project number, project name, and the number of employees who work on that project.**

```
Q16: SELECT PNUMBER, PNAME, COUNT (*) FROM
PROJECT, WORKS_ON
WHERE PNUMBER=PNO GROUP
BY PNUMBER, PNAME
```

**THE HAVING-CLAUSE**

Sometimes we want to retrieve the values of these functions for only those groups that satisfy certain conditions. The HAVING-clause is used for specifying a selection condition on groups (rather thanon individual tuples)

**Query 17: For each project on which more than two employees work, retrieve the project number, project name, and the number of employees who work on that project.**

```
Q17: SELECT PNUMBER, PNAME, COUNT (*) FROM
PROJECT, WORKS_ON
WHERE PNUMBER=PNO GROUP
BY PNUMBER, PNAME
HAVING COUNT (*) > 2
```

**SUBSTRING COMPARISON**

The LIKE comparison operator is used to compare partial strings. Two reserved charactersare used: **'%'** (or '*' in some implementations) replaces an arbitrary number of characters, and **'_'** replaces a single arbitrary character.

**Query 18: Retrieve all employees whose address is in Houston, Texas. Here, the value of the ADDRESS attribute must contain the substring 'Houston,TX' in it.**

```
Q18: SELECT FNAME, LNAME
FROM EMPLOYEE WHERE ADDRESS LIKE '%Houston,TX%'
```

**Query 19: Retrieve all employees who were born during the 1950s.**

Here, '5' must be the 8th character of the string (according to our format for date), so the BDATE value is '_____5_', with each underscore as a place holder for a single arbitrarycharacter.

```
Q19: SELECT FNAME, LNAME
FROM EMPLOYEE WHERE BDATE LIKE '_____5_'
```

**Note:** The LIKE operator allows us to get around the fact that each value is considered atomic and indivisible. Hence, in SQL, character string attribute values are not atomic

**ARITHMETIC OPERATIONS**

The standard arithmetic operators '+', '-'. '*', and '/' (for addition, subtraction, multiplication, and division, respectively) can be applied to numeric values in an SQL query result

**Query 20: Show the effect of giving all employees who work on the 'ProductX' project a 10% raise.**

```
Q20: SELECT FNAME, LNAME, 1.1*SALARY FROM
EMPLOYEE, WORKS_ON, PROJECT WHERESSN=ESSN
AND PNO=PNUMBER AND PNAME='ProductX'
```

**ORDER BY**

The ORDER BY clause is used to sort the tuples in a query result based on the values of some attribute(s)

**Query 21: Retrieve a list of employees and the projects each works in, ordered by the employee's department, and within each department ordered alphabetically by employee last name.**

```
Q21: SELECT DNAME, LNAME, FNAME, PNAME
FROM DEPARTMENT, EMPLOYEE, WORKS_ON,
PROJECT WHERE DNUMBER=DNO
AND SSN=ESSN
AND PNO=PNUMBER
ORDER BY DNAME,
LNAME
```

The default order is in ascending order of values. We can specify the keyword DESC if we want a descending order; the keyword ASC can be used to explicitly specify ascending order, even though it is the default

Ex: ORDER BY DNAME **DESC**, LNAME **ASC**, FNAME

**ASC MORE EXAMPLE QUERIES:**

**Query 22: Retrieve the names of all employees who have two or more dependents.**

```
Q22: SELECT LNAME, FNAME FROM
EMPLOYEE
WHERE (SELECT COUNT (*) FROM
    DEPENDENT WHERE SSN=ESSN) ≥ 2);
```

**Query 23: List the names of managers who have least one dependent.**

```
Q23: SELECT FNAME, LNAME
    FROM EMPLOYEE
 WHERE EXISTS (SELECT * FROM DEPENDENT WHERE SSN=ESSN)
AND EXISTS ( SELECT * FROM DEPARTMENT WHERE SSN=MGRSSN );
```

**SPECIFYING UPDATES IN SQL**

There are three SQL commands to modify the database: **INSERT**, **DELETE**, and **UPDATE.** **INSERT**

- In its simplest form, it is used to add one or more tuples to a relation
- Attribute values should be listed in the same order as the attributes were specified in the **CREATE TABLE** command

**Example:**

INSERT INTO EMPLOYEE VALUES ('Richard','K','Marini', '653298653', '30 -DEC-52', '98 Oak Forest,Katy,TX', 'M', 37000,'987654321', 4 )

- An alternate form of INSERT specifies explicitly the attribute names that correspond to the values in the new tuple. Attributes with NULL values can be left out

**Example:** Insert a tuple for a new EMPLOYEE for whom we only know the FNAME, LNAME, and SSN attributes.

INSERT INTO EMPLOYEE (FNAME, LNAME, SSN)VALUES ('Richard', 'Marini', '653298653')

**Important Note**: Only the constraints specified in the DDL commands are automatically enforced by the DBMS when updates are applied to the database. Another variation of INSERT allows insertion of multiple tuples resulting from a **query** into a relation

**Example:** Suppose we want to create a temporary table that has the name, number of employees, and total salaries for each department. A table DEPTS_INFO is created first, and is loaded with the summary information retrieved from the database by the query.

```
CREATE TABLE DEPTS_INFO
(DEPT_NAME VARCHAR (10),
NO_OF_EMPS INTEGER, TOTAL_SAL INTEGER);

INSERT INTO DEPTS_INFO (DEPT_NAME, NO_OF_EMPS, TOTAL_SAL) SELECT
DNAME, COUNT (*), SUM (SALARY) FROM DEPARTMENT, EMPLOYEE WHERE
DNUMBER=DNO GROUP BY DNAME ;
```

**Note:** The DEPTS_INFO table may not be up-to-date if we change the tuples in either the DEPARTMENT or the EMPLOYEE relations *after* issuing the above. We have to create a view (see later) to keep such a table up to date.

**DELETE**

- Removes tuples from a relation. Includes a WHERE-clause to select the tuples to be deleted
- Referential integrity should be enforced
- Tuples are deleted from only *one table* at a time (unless CASCADE is specified on a referential integrity constraint)

- A missing WHERE-clause specifies that *all tuples* in the relation are to be deleted; the table then becomes an empty table
- The number of tuples deleted depends on the number of tuples in the relation that satisfy the WHERE-clause

Examples:

1: DELETE FROM EMPLOYEE WHERE LNAME='Brown';

2: DELETE FROM EMPLOYEE WHERE SSN='123456789';

3: DELETE FROM EMPLOYEE WHERE DNO IN (SELECT DNUMBER FROM DEPARTMENT WHERE DNAME='Research');

4: DELETE FROM EMPLOYEE;

**UPDATE**

- Used to modify attribute values of one or more selected tuples
- A WHERE-clause selects the tuples to be modified
- An additional SET-clause specifies the attributes to be modified and their newvalues
- Each command modifies tuples *in the same relation*
- Referential integrity should be enforced

**Example1:** Change the location and controlling department number of project number 10 to 'Bellaire' and 5, respectively.

```
UPDATE PROJECT
SET PLOCATION = 'Bellaire', DNUM = 5 WHERE PNUMBER=10;
```

**Example2:** Give all employees in the 'Research' department a 10% raise in salary.

```
UPDATE EMPLOYEE
SET SALARY = SALARY *1.1
WHERE DNO IN (SELECT DNUMBER FROM DEPARTMENT
WHERE DNAME='Research');
```

## SQL TRIGGERS

- Objective: to monitor a database andtake initiate action when a condition occurs
- Triggers are nothing but the procedures/functions that involve actions and fired/executed automatically whenever an event occurs such as an insert, delete, or update operation or pressing a button or when mouse button is clicked

## 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.

# LAB EXPERIMENTS

*PART A: SQL PROGRAMMING*

## PROGRAM 1

**1. Consider the following schema for a Library Database:**

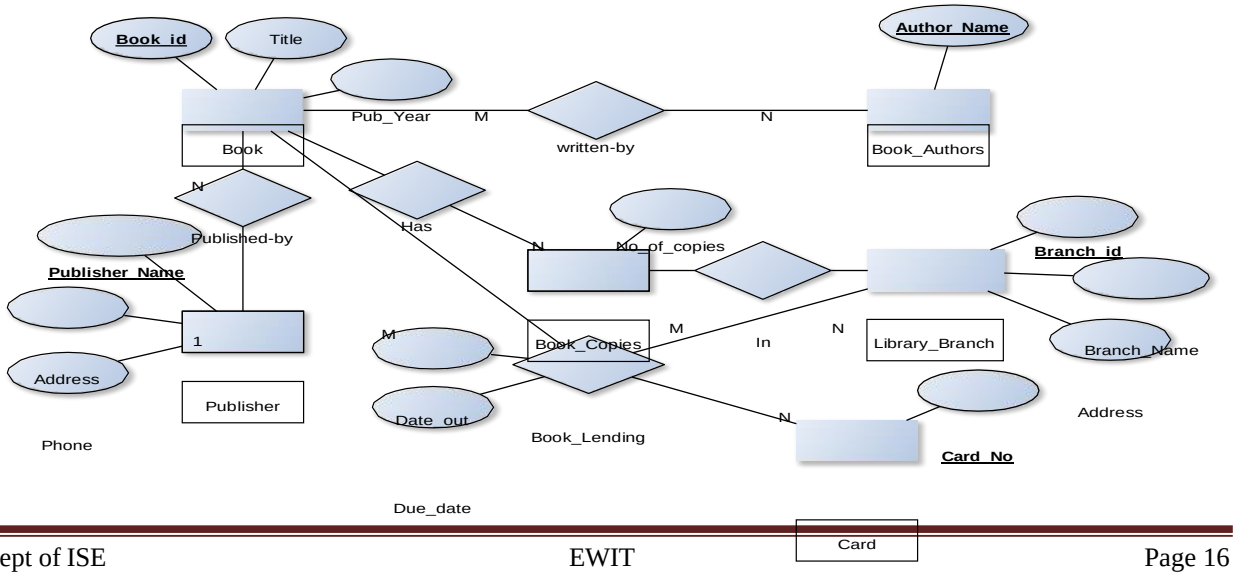
**BOOK (*Book_id, Title, Publisher_Name, Pub_Year*)**
**BOOK_AUTHORS (Book_id, Author_*Name*)**
**PUBLISHER (*Name, Address, Phone*)**
**BOOK_COPIES (*Book_id, Branch_id, No_of_Copies*)**
**BOOK_LENDING (*Book_id, Branch_id, Card_No, Date_Out, Due_Date* )**
**LIBRARY_BRANCH (*Branch_id, Branch_Name, Address*)**

**Write SQL queries to**

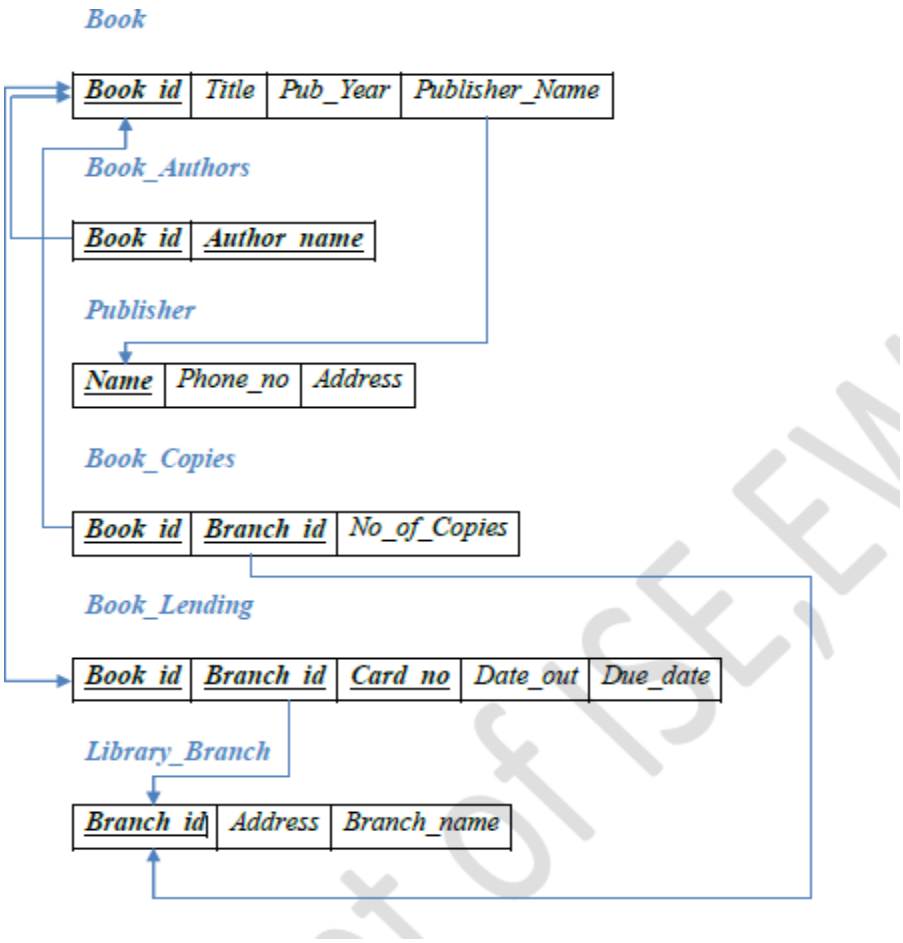
1. **Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.**
2. **Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017**
3. **Delete a book in BOOK table. Update the contents of other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

**Solution:**

**Entity-Relationship Diagram**



## Schema Diagram




## Table Creation

```
CREATE TABLE PUBLISHER
(NAME VARCHAR2 (20) PRIMARY KEY,
PHONE INTEGER,
ADDRESS VARCHAR2 (20));

CREATE TABLE BOOK
(BOOK_ID INTEGER PRIMARY
KEY, TITLE VARCHAR2 (20),
PUB_YEAR VARCHAR2 (20),
PUBLISHER_NAME REFERENCES PUBLISHER (NAME) ON DELETE CASCADE);
```

```
CREATE TABLE BOOK_AUTHORS
(AUTHOR_NAME VARCHAR2 (20),
BOOK_ID REFERENCES BOOK (BOOK_ID) ON DELETE
CASCADE, PRIMARY KEY (BOOK_ID, AUTHOR_NAME));

CREATE TABLE LIBRARY_BRANCH
(BRANCH_ID INTEGER PRIMARY KEY,
BRANCH_NAME VARCHAR2 (50),
ADDRESS VARCHAR2 (50));

CREATE TABLE BOOK_COPIES
(NO_OF_COPIES INTEGER,
BOOK_ID REFERENCES BOOK (BOOK_ID) ON DELETE CASCADE,
BRANCH_ID REFERENCES LIBRARY_BRANCH (BRANCH_ID) ON
          DELETE CASCADE,
PRIMARY KEY (BOOK_ID, BRANCH_ID));

CREATE TABLE
BOOK_LENDING (DATE_OUT
DATE,
DUE_DATE DATE,
BOOK_ID REFERENCES BOOK (BOOK_ID) ON DELETE CASCADE,
BRANCH_ID REFERENCES LIBRARY_BRANCH (BRANCH_ID) ON
          DELETE CASCADE,
CARD_NO INTEGER,
PRIMARY KEY (BOOK_ID, BRANCH_ID, CARD_NO));
```

## Table Descriptions

DESC PUBLISHER;

```
SQL> desc publisher;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 NAME                                      NOT NULL VARCHAR2(20)
 PHONE                                              NUMBER(38)
 ADDRESS                                            VARCHAR2(20)
```

DESC BOOK;

```
SQL> DESC BOOK;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 BOOK_ID                                   NOT NULL NUMBER(38)
 TITLE                                              VARCHAR2(20)
 PUB_YEAR                                           VARCHAR2(20)
 PUBLISHER_NAME                                     VARCHAR2(20)
```

DESC BOOK_AUTHORS;

```
SQL> DESC BOOK_AUTHORS;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 AUTHOR_NAME                               NOT NULL VARCHAR2(20)
 BOOK_ID                                   NOT NULL NUMBER(38)
```

DESC LIBRARY_BRANCH;

```
SQL> DESC LIBRARY_BRANCH;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 BRANCH_ID                                 NOT NULL NUMBER(38)
 BRANCH_NAME                                        VARCHAR2(50)
 ADDRESS                                            VARCHAR2(50)
```

DESC BOOK_COPIES;

```
SQL> DESC BOOK_COPIES;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 NO_OF_COPIES                                       NUMBER(38)
 BOOK_ID                                   NOT NULL NUMBER(38)
 BRANCH_ID                                 NOT NULL NUMBER(38)
```

DESC BOOK_LENDING;

```
SQL> desc book_lending;
 Name
 ----------------------------------------------------------------------------------------------------
 DATE_OUT
 DUE_DATE
 BOOK_ID
 BRANCH_ID
 CARD_NO
```

**Insertion of Values to Tables**

INSERT INTO PUBLISHER VALUES (’MCGRAW-HILL’, 9989076587, ‘BANGALORE’);
INSERT INTO PUBLISHER VALUES (’PEARSON’, 9889076565, ‘NEWDELHI’);
INSERT INTO PUBLISHER VALUES (’RANDOM HOUSE’, 7455679345, ‘HYDRABAD’);
INSERT INTO PUBLISHER VALUES (’HACHETTE LIVRE’, 8970862340, ‘CHENAI’); INSERT INTO PUBLISHER VALUES (’GRUPO PLANETA’, 7756120238, ‘BANGALORE’);

INSERT INTO BOOK VALUES (1,'DBMS','JAN-2017', 'MCGRAW-HILL');
INSERT INTO BOOK VALUES (2,'ADBMS','JUN-2016', 'MCGRAW-HILL');
INSERT INTO BOOK VALUES (3,'CN','SEP-2016', 'PEARSON');
INSERT INTO BOOK VALUES (4,'CG','SEP-2015', 'GRUPO PLANETA');
INSERT INTO BOOK VALUES (5,'OS','MAY-2016', 'PEARSON');

INSERT INTO BOOK_AUTHORS VALUES ('NAVATHE', 1); INSERT INTO BOOK_AUTHORS VALUES ('NAVATHE', 2); INSERT INTO BOOK_AUTHORS VALUES ('TANENBAUM', 3); INSERT INTO BOOK_AUTHORS VALUES ('EDWARD ANGEL', 4); INSERT INTO BOOK_AUTHORS VALUES ('GALVIN', 5);

INSERT INTO LIBRARY_BRANCH VALUES (10,'RR NAGAR','BANGALORE');
INSERT INTO LIBRARY_BRANCH VALUES (11,'RNSIT','BANGALORE');
INSERT INTO LIBRARY_BRANCH VALUES (12,'RAJAJI NAGAR', 'BANGALORE');
INSERT INTO LIBRARY_BRANCH VALUES (13,'NITTE','MANGALORE');
INSERT INTO LIBRARY_BRANCH VALUES (14,'MANIPAL','UDUPI');

INSERT INTO BOOK_COPIES VALUES (10, 1, 10);
INSERT INTO BOOK_COPIES VALUES (5, 1, 11);
INSERT INTO BOOK_COPIES VALUES (2, 2, 12);
INSERT INTO BOOK_COPIES VALUES (5, 2, 13);
INSERT INTO BOOK_COPIES VALUES (7, 3, 14);
INSERT INTO BOOK_COPIES VALUES (1, 5, 10);
INSERT INTO BOOK_COPIES VALUES (3, 4, 11);

INSERT INTO BOOK_LENDING VALUES ('01-JAN-17','01-JUN-17', 1, 10, 101);
INSERT INTO BOOK_LENDING VALUES ('11-JAN-17','11-MAR-17', 3, 14, 101);
INSERT INTO BOOK_LENDING VALUES ('21-FEB-17','21-APR-17', 2, 13, 101);
INSERT INTO BOOK_LENDING VALUES ('15-MAR-17','15-JUL-17', 4, 11, 101);
INSERT INTO BOOK_LENDING VALUES ('12-APR-17','12-MAY-17', 1, 11, 104);

SELECT * FROM PUBLISHER;

```
SQL> select * from publisher;

NAME                      PHONE ADDRESS
------------------- ---------- --------------------
MCGRAW-HILL           9989076587 BANGALORE
PEARSON               9889076565 NEWDELHI
RANDOM HOUSE          7455679345 HYDRABAD
HACHETTE LIVRE        8970862340 CHENAI
GRUPO PLANETA         7756120238 BANGALORE
```

```
SQL> SELECT * FROM BOOK;

   BOOK_ID TITLE                PUB_YEAR             PUBLISHER_NAME
---------- -------------------- -------------------- --------------------
         1 DBMS                 JAN-2017             MCGRAW-HILL
         2 ADBMS                JUN-2016             MCGRAW-HILL
         3 CN                   SEP-2016             PEARSON
         4 CG                   SEP-2015             GRUPO PLANETA
         5 OS                   MAY-2016             PEARSON


SQL> SELECT * FROM BOOK_AUTHORS;

AUTHOR_NAME             BOOK_ID
-------------------- ----------
NAVATHE                      1
NAVATHE                      2
TANENBAUM                    3
EDWARD ANGEL                 4
GALVIN                       5

SQL> SELECT * FROM LIBRARY_BRANCH;

 BRANCH_ID BRANCH_NAME                                        ADDRESS
---------- -------------------------------------------------- ----------------------------------------
        10 RR NAGAR                                          BANGALORE
        11 RNSIT                                             BANGALORE
        12 RAJAJI NAGAR                                      BANGALORE
        13 NITTE                                             MANGALORE
        14 MANIPAL                                           UDUPI

SQL> SELECT * FROM BOOK_COPIES;

NO_OF_COPIES    BOOK_ID  BRANCH_ID
------------ ---------- ----------
          10          1         10
           5          1         11
           2          2         12
           5          2         13
           7          3         14
           1          5         10
           3          4         11


SQL> select * from book_lending;

DATE_OUT  DUE_DATE     BOOK_ID  BRANCH_ID    CARD_NO
--------- --------- ---------- ---------- ----------
01-JAN-17 01-JUN-17          1         10        101
11-JAN-17 11-MAR-17          3         14        101
21-FEB-17 21-APR-17          2         13        101
15-MAR-17 15-JUL-17          4         11        101
12-APR-17 12-MAY-17          1         11        104
```

**Queries:**

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

```
SELECT B.BOOK_ID, B.TITLE, B.PUBLISHER_NAME, A.AUTHOR_NAME,
C.NO_OF_COPIES, L.BRANCH_ID
FROM BOOK B, BOOK_AUTHORS A, BOOK_COPIES C, LIBRARY_BRANCH L
WHERE B.BOOK_ID=A.BOOK_ID
AND B.BOOK_ID=C.BOOK_ID
AND L.BRANCH_ID=C.BRANCH_ID;
```

| BOOK_ID | TITLE | PUBLISHER_NAME | AUTHOR_NAME | NO_OF_COPIES | BRANCH_ID |
|---|---|---|---|---|---|
| 1 | DBMS | MCGRAW-HILL | NAVATHE | 10 | 10 |
| 1 | DBMS | MCGRAW-HILL | NAVATHE | 5 | 11 |
| 2 | ADBMS | MCGRAW-HILL | NAVATHE | 2 | 12 |
| 2 | ADBMS | MCGRAW-HILL | NAVATHE | 5 | 13 |
| 3 | CN | PEARSON | TANENBAUM | 7 | 14 |
| 5 | OS | PEARSON | GALVIN | 1 | 10 |
| 4 | CG | GRUPO PLANETA | EDWARD ANGEL | 3 | 11 |

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

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

| CARD_NO |
|---|
| 101 |

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

```
DELETE FROM BOOK
WHERE BOOK_ID=3;
```

```
SQL> DELETE FROM BOOK
  2  WHERE BOOK_ID=3;

1 row deleted.

SQL> SELECT * FROM BOOK;

   BOOK_ID TITLE                PUB_YEAR             PUBLISHER_NAME
---------- -------------------- -------------------- --------------------
         1 DBMS                 JAN-2017             MCGRAW-HILL
         2 ADBMS                JUN-2016             MCGRAW-HILL
         4 CG                   SEP-2015             GRUPO PLANETA
         5 OS                   MAY-2016             PEARSON
```

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

```
CREATE VIEW V_PUBLICATION AS
SELECT PUB_YEAR
FROM BOOK;
```

```
PUB_YEAR
-------------
JAN-2017
JUN-2016
SEP-2016
SEP-2015
MAY-2016
```

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

```
CREATE VIEW V_BOOKS AS
SELECT B.BOOK_ID, B.TITLE, C.NO_OF_COPIES
FROM BOOK B, BOOK_COPIES C, LIBRARY_BRANCH L
WHERE B.BOOK_ID=C.BOOK_ID
AND C.BRANCH_ID=L.BRANCH_ID;
```

```
 BOOK_ID TITLE                NO_OF_COPIES
-------- -------------------- ------------
       1 DBMS                           10
       1 DBMS                            5
       2 ADBMS                           2
       2 ADBMS                           5
       3 CN                              7
       5 OS                              1
       4 CG                              3
```

## PROGRAM 2

**2. Consider the following schema for Order Database:**

**SALESMAN (*Salesman_id, Name,* City, Commission*)***

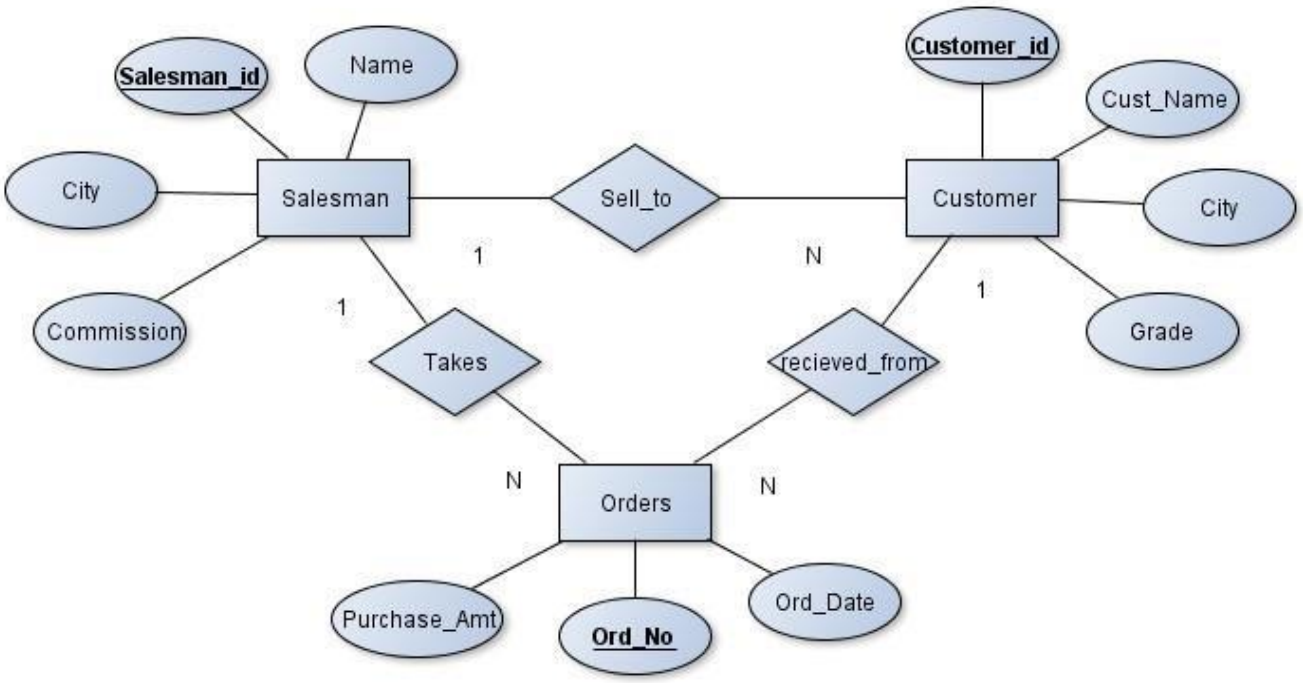
**CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*)**
**ORDERS (*Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id*)**

**Write SQL queries to**

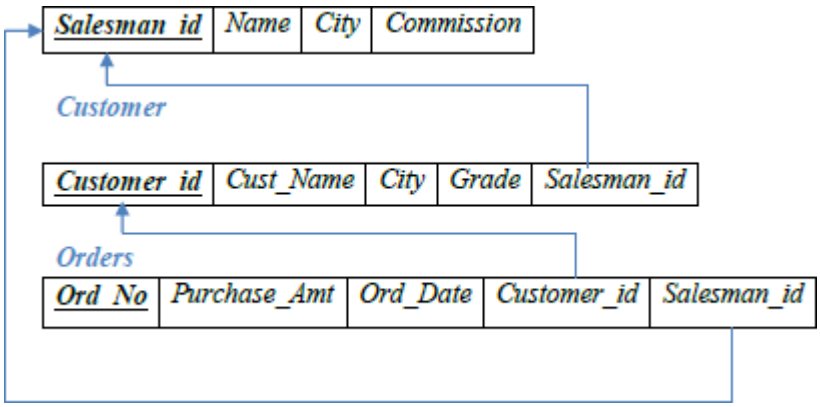
1. **Count the customers with grades above Bangalore's average.**
2. **Find the name and numbers of all salesmen who had more than one customer.**
3. **List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)**
4. **Create a view that finds the salesman 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.**

**Solution:**

**Entity-Relationship Diagram**



## Schema Diagram




## Table Creation

```
CREATE TABLE SALESMAN
(SALESMAN_ID NUMBER (4),
NAME VARCHAR2 (20),
CITY VARCHAR2 (20),
COMMISSION VARCHAR2 (20),
PRIMARY KEY (SALESMAN_ID));

CREATE TABLE CUSTOMER1
(CUSTOMER_ID NUMBER (4),
CUST_NAME VARCHAR2 (20),
CITY VARCHAR2 (20),
GRADE NUMBER (3),
PRIMARY KEY (CUSTOMER_ID),
SALESMAN_ID REFERENCES SALESMAN (SALESMAN_ID) ON DELETE SET NULL);

CREATE TABLE ORDERS
(ORD_NO NUMBER (5),
PURCHASE_AMT NUMBER (10, 2),
ORD_DATE DATE,
PRIMARY KEY (ORD_NO),
CUSTOMER_ID REFERENCES CUSTOMER1 (CUSTOMER_ID) ON DELETE CASCADE,
SALESMAN_ID REFERENCES SALESMAN (SALESMAN_ID) ON DELETE CASCADE);
```

## Table Descriptions

```
SQL> DESC SALESMAN;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 SALESMAN_ID                               NOT NULL NUMBER(4)
 NAME                                               VARCHAR2(15)
 CITY                                               VARCHAR2(15)
 COMMISSION                                         NUMBER(3,2)

SQL> DESC CUSTOMER1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 CUSTOMER_ID                               NOT NULL NUMBER(4)
 CUST_NAME                                          VARCHAR2(15)
 CITY                                               VARCHAR2(15)
 GRADE                                              NUMBER(3)
 SALESMAN_ID                                        NUMBER(4)

SQL> DESC ORDERS;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 ORD_NO                                    NOT NULL NUMBER(5)
 PURCHASE_AMT                                       NUMBER(10,2)
 ORD_DATE                                           DATE
 CUSTOMER_ID                                        NUMBER(4)
 SALESMAN_ID                                        NUMBER(4)
```

## Insertion of Values to Tables

INSERT INTO SALESMAN VALUES (1000, 'JOHN','BANGALORE','25 %');
INSERT INTO SALESMAN VALUES (2000, 'RAVI','BANGALORE','20 %');
INSERT INTO SALESMAN VALUES (3000, 'KUMAR','MYSORE','15 %');
INSERT INTO SALESMAN VALUES (4000, 'SMITH','DELHI','30 %'); INSERT
INTO SALESMAN VALUES (5000, 'HARSHA','HYDRABAD','15 %');

INSERT INTO CUSTOMER1 VALUES (10, 'PREETHI','BANGALORE', 100, 1000);
INSERT INTO CUSTOMER1 VALUES (11, 'VIVEK','MANGALORE', 300, 1000);
INSERT INTO CUSTOMER1 VALUES (12, 'BHASKAR','CHENNAI', 400, 2000);
INSERT INTO CUSTOMER1 VALUES (13, 'CHETHAN','BANGALORE', 200, 2000);
INSERT INTO CUSTOMER1 VALUES (14, 'MAMATHA','BANGALORE', 400, 3000);

INSERT INTO ORDERS VALUES (50, 5000, '04-MAY-17', 10, 1000);
INSERT INTO ORDERS VALUES (51, 450, '20-JAN-17', 10, 2000);
INSERT INTO ORDERS VALUES (52, 1000, '24-FEB-17', 13, 2000);
INSERT INTO ORDERS VALUES (53, 3500, '13-APR-17', 14, 3000);
INSERT INTO ORDERS VALUES (54, 550, '09-MAR-17', 12, 2000);

SELECT * FROM SALESMAN;

| SALESMAN_ID | NAME | CITY | COMMISSION |
|---|---|---|---|
| 1000 | JOHN | BANGALORE | 25 % |
| 2000 | RAVI | BANGALORE | 20 % |
| 3000 | KUMAR | MYSORE | 15 % |
| 4000 | SMITH | DELHI | 30 % |
| 5000 | HARSHA | HYDRABAD | 15 % |

SELECT * FROM CUSTOMER1;

| CUSTOMER_ID | CUST_NAME | CITY | GRADE | SALESMAN_ID |
|---|---|---|---|---|
| 10 | PREETHI | BANGALORE | 100 | 1000 |
| 11 | VIVEK | MANGALORE | 300 | 1000 |
| 12 | BHASKAR | CHENNAI | 400 | 2000 |
| 13 | CHETHAN | BANGALORE | 200 | 2000 |
| 14 | MAMATHA | BANGALORE | 400 | 3000 |

SELECT * FROM ORDERS;

| ORD_NO | PURCHASE_AMT | ORD_DATE | CUSTOMER_ID | SALESMAN_ID |
|---|---|---|---|---|
| 50 | 5000 | 04-MAY-17 | 10 | 1000 |
| 51 | 450 | 20-JAN-17 | 10 | 2000 |
| 52 | 1000 | 24-FEB-17 | 13 | 2000 |
| 53 | 3500 | 13-APR-17 | 14 | 3000 |
| 54 | 550 | 09-MAR-17 | 12 | 2000 |

**Queries:**

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

```
SELECT GRADE, COUNT (DISTINCT CUSTOMER_ID)
FROM CUSTOMER1
GROUP BY GRADE
HAVING GRADE > (SELECT AVG(GRADE)
FROM CUSTOMER1
WHERE CITY='BANGALORE');
```

| GRADE | COUNT(DISTINCTCUSTOMER_ID) |
|---|---|
| 300 | 1 |
| 400 | 2 |

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

```
SELECT SALESMAN_ID, NAME
FROM SALESMAN A
WHERE 1 < (SELECT COUNT (*)
FROM CUSTOMER1
WHERE SALESMAN_ID=A.SALESMAN_ID);
```

```
SALESMAN_ID NAME
----------- --------------------
       1000 JOHN
       2000 RAVI
```

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

```
SELECT SALESMAN.SALESMAN_ID, NAME, CUST_NAME, COMMISSION
FROM SALESMAN, CUSTOMER1
WHERE SALESMAN.CITY = CUSTOMER1.CITY
UNION
SELECT SALESMAN_ID, NAME, 'NO MATCH', COMMISSION
FROM SALESMAN
WHERE NOT CITY = ANY
 (SELECT CITY
  FROM        CUSTOMER1)
ORDER BY 2 DESC;
```

```
SALESMAN_ID NAME                 CUST_NAME            COMMISSION
----------- -------------------- -------------------- --------------------
       4000 SMITH                NO MATCH             30 %
       2000 RAVI                 CHETHAN              20 %
       2000 RAVI                 MAMATHA              20 %
       2000 RAVI                 PREETHI              20 %
       3000 KUMAR                NO MATCH             15 %
       1000 JOHN                 CHETHAN              25 %
       1000 JOHN                 MAMATHA              25 %
       1000 JOHN                 PREETHI              25 %
       5000 HARSHA               NO MATCH             15 %
```

;

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

```
CREATE VIEW ELITSALESMAN AS
SELECT B.ORD_DATE, A.SALESMAN_ID, A.NAME
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);
SELECT *FROM ELITSALESMAN;
```

```
SALESMAN_ID NAME                 CUST_NAME            COMMISSION
----------- -------------------- -------------------- --------------------
       4000 SMITH                NO MATCH             30 %
       2000 RAVI                 CHETHAN              20 %
       2000 RAVI                 MAMATHA              20 %
       2000 RAVI                 PREETHI              20 %
       3000 KUMAR                NO MATCH             15 %
       1000 JOHN                 CHETHAN              25 %
       1000 JOHN                 MAMATHA              25 %
       1000 JOHN                 PREETHI              25 %
       5000 HARSHA               NO MATCH             15 %
```

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

Use ON DELETE CASCADE at the end of foreign key definitions while creating child table orders and then execute the following:

Use ON DELETE SET NULL at the end of foreign key definitions while creating child table customers and then executes the following:

```
DELETE    FROM    SALESMAN
WHERE SALESMAN_ID=1000;
```

```
SQL> DELETE FROM SALESMAN
  2  WHERE SALESMAN_ID=1000;

1 row deleted.

SQL> SELECT * FROM SALESMAN;

SALESMAN_ID NAME                 CITY                 COMMISSION
----------- -------------------- -------------------- ----------
       2000 RAVI                 BANGALORE            20 %
       3000 KUMAR                MYSORE               15 %
       4000 SMITH                DELHI                30 %
       5000 HARSHA               HYDRABAD             15 %
```

## PROGRAM 3

**3. Consider the schema for Movie Database:**

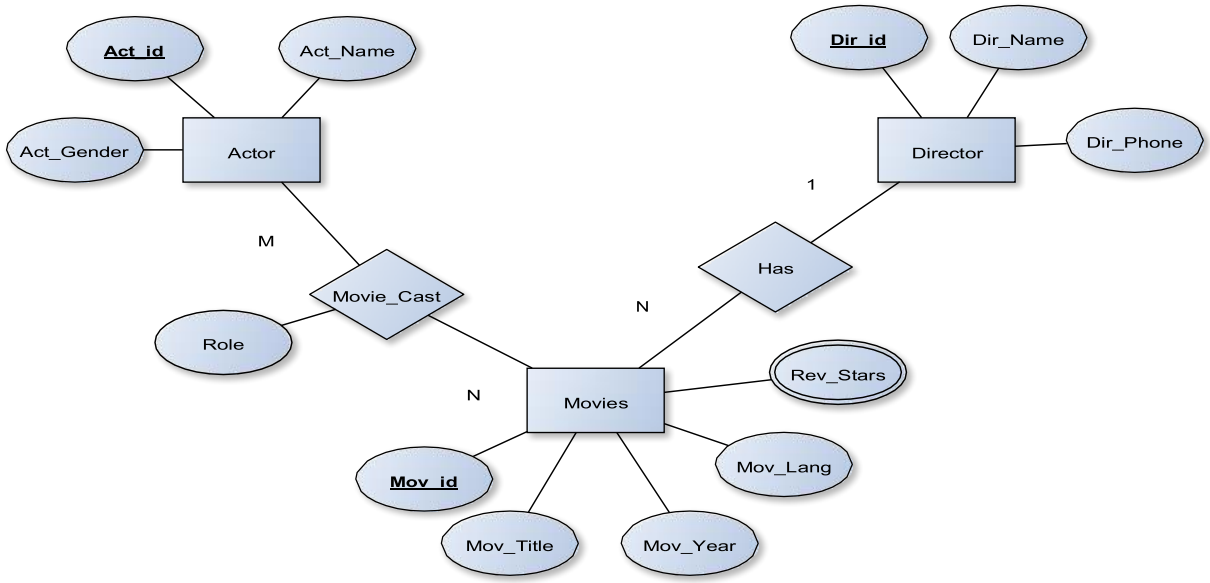
**ACTOR (*Act_id*, *Act_Name*, *Act_Gender*)**
**DIRECTOR (*Dir_id*, *Dir_Name*, *Dir_Phone*)**
**MOVIES (*Mov_id*, *Mov_Title*, *Mov_Year*, *Mov_Lang*, *Dir_id*)**
**MOVIE_CAST (*Act_id*, *Mov_id*, *Role*)**
**RATING (*Mov_id*, *Rev_Stars*)**

**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.**

**Solution:**

**Entity-Relationship Diagram**



**Schema Diagram**

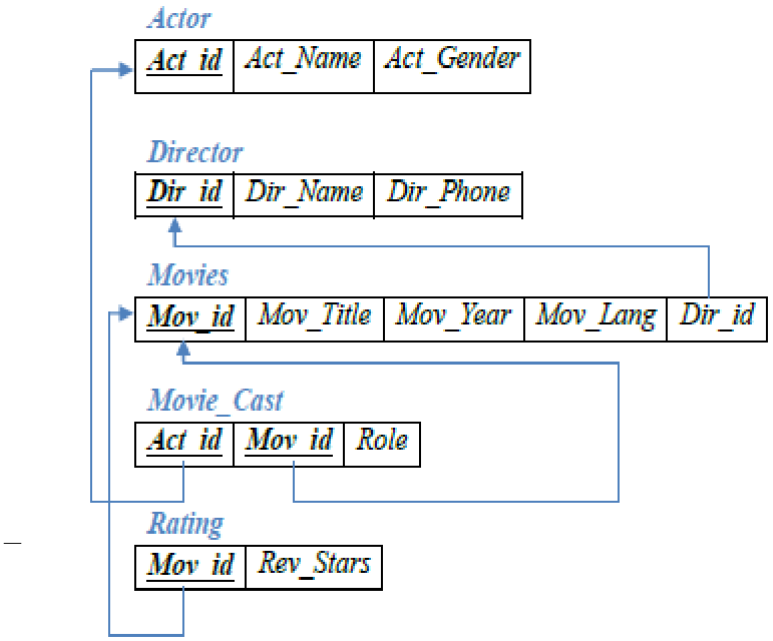



**Table Creation**

```
CREATE TABLE ACTOR (
ACT_ID NUMBER (3),
ACT_NAME VARCHAR (20),
ACT_GENDER CHAR (1),
PRIMARY KEY (ACT_ID));

CREATE TABLE DIRECTOR (
DIR_ID NUMBER (3),
DIR_NAME VARCHAR (20),
DIR_PHONE NUMBER (10),
PRIMARY KEY (DIR_ID));

CREATE TABLE MOVIES (
MOV_ID NUMBER (4),
MOV_TITLE VARCHAR (25),
MOV_YEAR NUMBER (4),
MOV_LANG VARCHAR (12),
DIR_ID NUMBER (3),
PRIMARY KEY (MOV_ID),
FOREIGN KEY (DIR_ID) REFERENCES DIRECTOR (DIR_ID));
```

```
CREATE TABLE MOVIE_CAST (
ACT_ID NUMBER (3),
MOV_ID NUMBER (4),
ROLE VARCHAR (10),
PRIMARY KEY (ACT_ID, MOV_ID),
FOREIGN KEY (ACT_ID) REFERENCES ACTOR (ACT_ID),
FOREIGN KEY (MOV_ID) REFERENCES MOVIES (MOV_ID));

CREATE TABLE RATING (
MOV_ID NUMBER (4),
REV_STARS VARCHAR (25),
PRIMARY KEY (MOV_ID),
FOREIGN KEY (MOV_ID) REFERENCES MOVIES (MOV_ID));
```

**Table Descriptions**

```
SQL> DESC ACTOR;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 ACT_ID                                    NOT NULL NUMBER(3)
 ACT_NAME                                           VARCHAR2(20)
 ACT_GENDER                                         CHAR(1)

SQL> DESC DIRECTOR;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DIR_ID                                    NOT NULL NUMBER(3)
 DIR_NAME                                           VARCHAR2(20)
 DIR_PHONE                                          NUMBER(10)


SQL> DESC MOVIES;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 MOV_ID                                    NOT NULL NUMBER(4)
 MOV_TITLE                                          VARCHAR2(25)
 MOV_YEAR                                           NUMBER(4)
 MOV_LANG                                           VARCHAR2(12)
 DIR_ID                                             NUMBER(3)

SQL> DESC MOVIE_CAST;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 ACT_ID                                    NOT NULL NUMBER(3)
 MOV_ID                                    NOT NULL NUMBER(4)
 ROLE                                               VARCHAR2(10)

SQL> DESC RATING;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 MOV_ID                                    NOT NULL NUMBER(4)
 REV_STARS                                          VARCHAR2(25)
```

**Insertion of Values to Tables**

INSERT INTO ACTOR VALUES (301,'ANUSHKA','F');
INSERT INTO ACTOR VALUES (302,'PRABHAS','M');
INSERT INTO ACTOR VALUES (303,'PUNITH','M');
INSERT INTO ACTOR VALUES (304,'JERMY','M');

INSERT INTO DIRECTOR VALUES (60,'RAJAMOULI', 8751611001);
INSERT INTO DIRECTOR VALUES (61,'HITCHCOCK', 7766138911);
INSERT INTO DIRECTOR VALUES (62,'FARAN', 9986776531);
INSERT INTO DIRECTOR VALUES (63,'STEVEN SPIELBERG', 8989776530);

INSERT INTO MOVIES VALUES (1001,'BAHUBALI-2', 2017, 'TELAGU', 60);
INSERT INTO MOVIES VALUES (1002,'BAHUBALI-1', 2015, 'TELAGU', 60);
INSERT INTO MOVIES VALUES (1003,'AKASH', 2008, 'KANNADA', 61);
INSERT INTO MOVIES VALUES (1004,'WAR HORSE', 2011, 'ENGLISH', 63);

INSERT INTO MOVIE_CAST VALUES (301, 1002, 'HEROINE');
INSERT INTO MOVIE_CAST VALUES (301, 1001, 'HEROINE');
INSERT INTO MOVIE_CAST VALUES (303, 1003, 'HERO'); INSERT INTO MOVIE_CAST VALUES (303, 1002, 'GUEST'); INSERT INTO MOVIE_CAST VALUES (304, 1004, 'HERO');

INSERT INTO RATING VALUES (1001, 4);
INSERT INTO RATING VALUES (1002, 2);
INSERT INTO RATING VALUES (1003, 5);
INSERT INTO RATING VALUES (1004, 4);

```
SQL> SELECT * FROM ACTOR;

    ACT_ID ACT_NAME             A
---------- -------------------- -
       301 ANUSHKA              F
       302 PRABHAS              M
       303 PUNITH               M
       304 JERMY                M

SQL> SELECT * FROM DIRECTOR;

    DIR_ID DIR_NAME              DIR_PHONE
---------- -------------------- ----------
        60 RAJAMOULI            8751611001
        61 HITCHCOCK            7766138911
        62 FARAN                9986776531
        63 STEVEN SPIELBERG     8989776530
```

```
SQL> SELECT * FROM MOVIES;

    MOV_ID MOV_TITLE                MOV_YEAR MOV_LANG         DIR_ID
---------- ------------------------ ---------- ------------ ----------
      1001 BAHUBALI-2                     2017 TELAGU               60
      1002 BAHUBALI-1                     2015 TELAGU               60
      1003 AKASH                          2008 KANNADA              61
      1004 WAR HORSE                      2011 ENGLISH              63


SQL> SELECT * FROM MOVIE_CAST;

    ACT_ID     MOV_ID ROLE
---------- ---------- ----------
       301       1002 HEROINE
       301       1001 HEROINE
       303       1003 HERO
       303       1002 GUEST
       304       1004 HERO


SQL> SELECT * FROM RATING;

    MOV_ID REV_STARS
---------- -----------------------
      1001 4
      1002 2
      1003 5
      1004 4
```

**Queries:**

**1. List the titles of all movies directed by 'Hitchcock'.**

```
SELECT    MOV_TITLE
FROM MOVIES
WHERE DIR_ID IN (SELECT DIR_ID
                 FROM DIRECTOR
                 WHERE DIR_NAME = 'HITCHCOCK');
```

```
MOV_TITLE
-------------------------
AKASH
```

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

```
SELECT MOV_TITLE
FROM MOVIES M, MOVIE_CAST MV
WHERE M.MOV_ID=MV.MOV_ID AND ACT_ID IN (SELECT ACT_ID
                                        FROM MOVIE_CAST GROUP BY ACT_ID
                                        HAVING COUNT (ACT_ID)>1)
GROUP BY MOV_TITLE
HAVING COUNT (*)>1;
```

```
MOV_TITLE
-------------------------
BAHUBALI-1
```

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

```
SELECT ACT_NAME, MOV_TITLE, MOV_YEAR
FROM ACTOR A
JOIN MOVIE_CAST C
      ON   A.ACT_ID=C.ACT_ID
JOIN MOVIES M
      ON C.MOV_ID=M.MOV_ID
WHERE M.MOV_YEAR NOT BETWEEN 2000 AND 2015;
```

OR

```
SELECT A.ACT_NAME, A.ACT_NAME, C.MOV_TITLE, C.MOV_YEAR
FROM ACTOR A, MOVIE_CAST B, MOVIES C
WHERE    A.ACT_ID=B.ACT_ID
AND B.MOV_ID=C.MOV_ID
AND C.MOV_YEAR NOT BETWEEN 2000 AND 2015;
```

```
ACT_NAME             MOV_TITLE                 MOV_YEAR
-------------------- ------------------------- ----------
ANUSHKA              BAHUBALI-2                      2017
```

**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.**

```
SELECT MOV_TITLE, MAX (REV_STARS)
FROM MOVIES
INNER JOIN RATING USING (MOV_ID)
GROUP BY MOV_TITLE
HAVING MAX (REV_STARS)>0
ORDER BY MOV_TITLE;
```

```
MOV_TITLE                 MAX(REV_STARS)
------------------------- -------------------------
AKASH                     5
BAHUBALI-1                2
BAHUBALI-2                4
WAR HORSE                 4
```

**5. Update rating of all movies directed by 'Steven Spielberg' to 5**

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

```
SQL> SELECT * FROM RATING;

    MOV_ID REV_STARS
---------- -------------------------
      1001 4
      1002 2
      1003 5
      1004 5
```

## PROGRAM 4

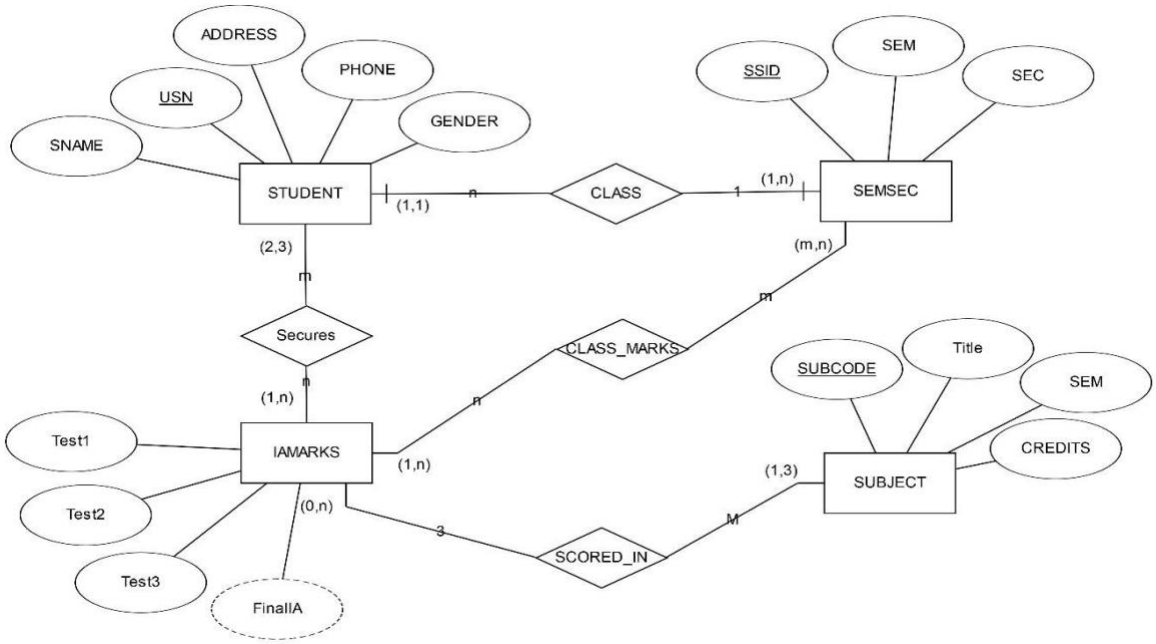
**4. Consider the schema for College Database:**

**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 allsubjects.**
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.**

**Solution:**

**Entity - Relationship Diagram**



**Schema Diagram**

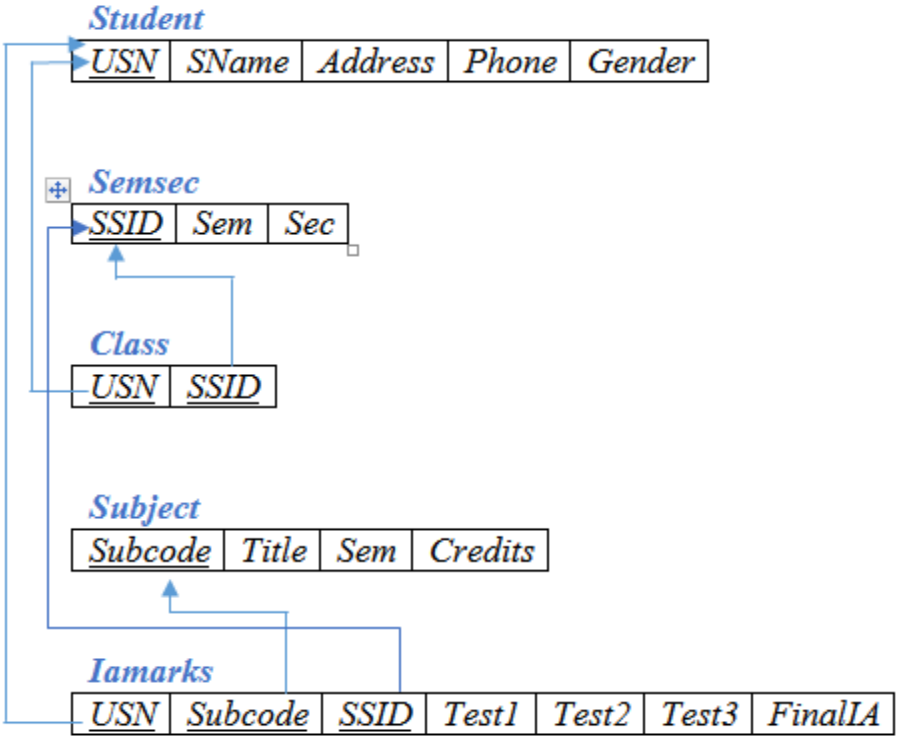



**Table Creation**

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

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

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

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

 CREATE TABLE IAMARKS (
 USN VARCHAR (10),
 SUBCODE VARCHAR (8),
 SSID VARCHAR (5),
 TEST1 NUMBER (2),
 TEST2 NUMBER (2),
 TEST3 NUMBER (2),
 FINALIA NUMBER (2),
 PRIMARY KEY (USN, SUBCODE, SSID),
FOREIGN KEY (USN) REFERENCES STUDENT (USN),
 FOREIGN KEY (SUBCODE) REFERENCES SUBJECT (SUBCODE),
 FOREIGN KEY (SSID) REFERENCES SEMSEC (SSID));
```

**Table Descriptions**

DESC STUDENT;

```
Name
-----------------------------------------------------------------------------------------------
USN
SNAME
ADDRESS
PHONE
GENDER


SQL> DESC SEMSEC;
 Name
 -----------------------------------------------------------------------------------
 SSID
 SEM
 SEC

SQL> DESC CLASS;
 Name
 ---------------------------------------------
 USN
 SSID
```

```
SQL> DESC SUBJECT1;
 Name
 -----------------------------------
 SUBCODE
 TITLE
 SEM
 CREDITS

SQL> DESC IAMARKS;
 Name
 -----------------------------------------------
 USN
 SUBCODE
 SSID
 TEST1
 TEST2
 TEST3
 FINALIA
```

**Insertion of values to tables**

INSERT INTO STUDENT VALUES ('1RN13CS020','AKSHAY','BELAGAVI', 8877881122,'M');
INSERT INTO STUDENT VALUES ('1RN13CS062','SANDHYA','BENGALURU', 7722829912,'F');
INSERT INTO STUDENT VALUES ('1RN13CS091','TEESHA','BENGALURU', 7712312312,'F');
INSERT INTO STUDENT VALUES ('1RN13CS066','SUPRIYA','MANGALURU', 8877881122,'F');
INSERT INTO STUDENTVALUES ('1RN14CS010','ABHAY','BENGALURU', 9900211201,'M');
INSERT INTO STUDENT VALUES ('1RN14CS032','BHASKAR','BENGALURU', 9923211099,'M');
INSERT INTO STUDENTVALUES ('1RN14CS025','ASMI','BENGALURU', 7894737377,'F');
INSERT INTO STUDENT VALUES ('1RN15CS011','AJAY','TUMKUR', 9845091341,'M');
INSERT INTO STUDENT VALUES ('1RN15CS029','CHITRA','DAVANGERE', 7696772121,'F');
INSERT INTO STUDENT VALUES ('1RN15CS045','JEEVA','BELLARY', 9944850121,'M');
INSERT INTO STUDENT VALUES ('1RN15CS091','SANTOSH','MANGALURU', 8812332201,'M');
INSERT INTO STUDENT VALUES ('1RN16CS045','ISMAIL','KALBURGI', 9900232201,'M');
INSERT INTO STUDENT VALUES ('1RN16CS088','SAMEERA','SHIMOGA', 9905542212,'F');

```
INSERT INTO STUDENT VALUES ('1RN16CS122','VINAYAKA','CHIKAMAGALUR',
8800880011,'M');

INSERT INTO SEMSEC VALUES ('CSE8A', 8,'A');
INSERT INTO SEMSEC VALUES (‘CSE8B', 8,'B');
INSERT INTO SEMSEC VALUES (‘CSE8C’, 8,’C’);

INSERT INTO SEMSEC VALUES ('CSE7A', 7,’A’);
INSERT INTO SEMSEC VALUES (‘CSE7B’, 7,'B’);
INSERT INTO SEMSEC VALUES ('CSE7C', 7,'C');

INSERT INTO SEMSEC VALUES (‘CSE6A', 6,'A');
INSERT INTO SEMSEC VALUES (‘CSE6B’, 6,’B’);
INSERT INTO SEMSEC VALUES ('CSE6C’, 6,’C’);

INSERT INTO SEMSEC VALUES (‘CSE5A’, 5,'A’);
INSERT INTO SEMSEC VALUES ('CSE5B', 5,'B');
INSERT INTO SEMSEC VALUES (‘CSE5C', 5,'C');

INSERT INTO SEMSEC VALUES (‘CSE4A’, 4,’A’);
INSERT INTO SEMSEC VALUES ('CSE4B', 4,’B’);
INSERT INTO SEMSEC VALUES (‘CSE4C’, 4,'C’);

INSERT INTO SEMSEC VALUES ('CSE3A', 3,'A');
INSERT INTO SEMSEC VALUES (‘CSE3B', 3,'B');
INSERT INTO SEMSEC VALUES (‘CSE3C’, 3,’C’);

INSERT INTO SEMSEC VALUES ('CSE2A', 2,’A’);
INSERT INTO SEMSEC VALUES (‘CSE2B’, 2,'B’);
INSERT INTO SEMSEC VALUES ('CSE2C', 2,'C');

 INSERT INTO SEMSEC VALUES (‘CSE1A', 1,'A');
INSERT INTO SEMSEC VALUES (‘CSE1B’, 1,’B’);
INSERT INTO SEMSEC VALUES ('CSE1C', 1,’C’);

INSERT INTO CLASS VALUES (‘1RN13CS020’,’CSE8A’);
INSERT INTO CLASS VALUES (‘1RN13CS062’,’CSE8A’);
INSERT INTO CLASS VALUES (‘1RN13CS066’,’CSE8B’);
INSERT INTO CLASS VALUES (‘1RN13CS091’,’CSE8C’);
```

```
INSERT INTO CLASS VALUES (‘1RN14CS010’,’CSE7A’);
INSERT INTO CLASS VALUES (‘1RN14CS025’,’CSE7A’);
INSERT INTO CLASS VALUES (‘1RN14CS032’,’CSE7A’);

INSERT INTO CLASS VALUES (‘1RN15CS011’,’CSE4A’);
INSERT INTO CLASS VALUES (‘1RN15CS029’,’CSE4A’);
INSERT INTO CLASS VALUES (‘1RN15CS045’,’CSE4B’);
INSERT INTO CLASS VALUES (‘1RN15CS091’,’CSE4C’);

INSERT INTO CLASS VALUES (‘1RN16CS045’,’CSE3A’);
INSERT INTO CLASS VALUES (‘1RN16CS088’,’CSE3B’);
INSERT INTO CLASS VALUES (‘1RN16CS122’,’CSE3C’);

INSERT INTO SUBJECT VALUES ('10CS81','ACA', 8, 4);
INSERT INTO SUBJECT VALUES ('10CS82','SSM', 8, 4);
INSERT INTO SUBJECT VALUES ('10CS83','NM', 8, 4);
INSERT INTO SUBJECT VALUES ('10CS84','CC', 8, 4);
INSERT INTO SUBJECT VALUES ('10CS85','PW', 8, 4);

INSERT INTO SUBJECT VALUES ('10CS71','OOAD', 7, 4);
INSERT INTO SUBJECT VALUES ('10CS72','ECS', 7, 4);
INSERT INTO SUBJECT VALUES ('10CS73','PTW', 7, 4);
INSERT INTO SUBJECT VALUES ('10CS74','DWDM', 7, 4);
INSERT INTO SUBJECT VALUES (‘10CS75','JAVA', 7, 4);
INSERT INTO SUBJECT VALUES ('10CS76','SAN', 7, 4);

INSERT INTO SUBJECT VALUES ('15CS51', 'ME', 5, 4);
INSERT INTO SUBJECT VALUES ('15CS52','CN', 5, 4);
INSERT INTO SUBJECT VALUES ('15CS53','DBMS', 5, 4);
INSERT INTO SUBJECT VALUES ('15CS54','ATC', 5, 4);
INSERT INTO SUBJECT VALUES ('15CS55','JAVA', 5, 3);
INSERT INTO SUBJECT VALUES ('15CS56','AI', 5, 3);
INSERT INTO SUBJECT VALUES ('15CS41','M4', 4, 4);
INSERT INTO SUBJECT VALUES ('15CS42','SE', 4, 4);INSERT
INTO SUBJECT VALUES ('15CS43','DAA', 4, 4); INSERT
INTO SUBJECT VALUES ('15CS44','MPMC', 4, 4); INSERT
INTO SUBJECT VALUES ('15CS45','OOC', 4, 3); INSERT
INTO SUBJECT VALUES ('15CS46','DC', 4, 3);

INSERT INTO SUBJECT VALUES ('15CS31','M3', 3, 4);
INSERT INTO SUBJECT VALUES ('15CS32','ADE', 3, 4);
```

```
INSERT INTO SUBJECT VALUES ('15CS33','DSA', 3, 4);
INSERT INTO SUBJECT VALUES ('15CS34','CO', 3, 4);
INSERT INTO SUBJECT VALUES ('15CS35','USP', 3, 3);
INSERT INTO SUBJECT VALUES ('15CS36','DMS', 3, 3);

INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3)
VALUES ('1RN13CS091','10CS81','CSE8C', 15, 16, 18);
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3)
VALUES ('1RN13CS091','10CS82','CSE8C', 12, 19, 14);
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3)
VALUES ('1RN13CS091','10CS83','CSE8C', 19, 15, 20);
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3)
VALUES ('1RN13CS091','10CS84','CSE8C', 20, 16, 19);
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3)
VALUES ('1RN13CS091','10CS85','CSE8C', 15, 15, 12);
```

```
SQL> SELECT * FROM STUDENT1;

USN        SNAME                     ADDRESS                       PHONE G
---------- ------------------------- ------------------------- ---------- -
1RN13CS020 AKSHAY                    BELAGAVI                  8877881122 M
1RN13CS062 SANDHYA                   BENGALURU                 7722829912 F
1RN13CS091 TEESHA                    BENGALURU                 7712312312 F
1RN13CS066 SUPRIYA                   MANGALURU                 8877881122 F
1RN14CS010 ABHAY                     BENGALURU                 9900211201 M
1RN14CS032 BHASKAR                   BENGALURU                 9923211099 M
1RN15CS011 AJAY                      TUMKUR                    9845091341 M
1RN15CS029 CHITRA                    DAVANGERE                 7696772121 F
1RN15CS045 JEEVA                     BELLARY                   9944850121 M
1RN15CS091 SANTOSH                   MANGALURU                 8812332201 M
1RN16CS045 ISMAIL                    KALBURGI                  9900232201 M
1RN16CS088 SAMEERA                   SHIMOGA                   9905542212 F
1RN16CS122 VINAYAKA                  CHIKAMAGALUR              8800880011 M
1RN14CS025 ASMI                      BENGALURU                 7894737377 F
```

```
SQL> SELECT * FROM SEMSEC;

SSID          SEM S
----- ---------- -
CSE8A           8 A
CSE8B           8 B
CSE8C           8 C
CSE7A           7 A
CSE7B           7 B
CSE7C           7 C
CSE6A           6 A
CSE6B           6 B
CSE6C           6 C
CSE5A           5 A
CSE5B           5 B
CSE5C           5 C
CSE4A           4 A
CSE4B           4 B
CSE4C           4 C
CSE3A           3 A
CSE3B           3 B
CSE3C           3 C
CSE2A           2 A
CSE2C           2 C
CSE2B           2 B
CSE1A           1 A
CSE1B           1 B
CSE1C           1 C

SQL> SELECT * FROM CLASS;

USN        SSID
---------- -----
1RN13CS020 CSE8A
1RN13CS062 CSE8A
1RN13CS066 CSE8B
1RN13CS091 CSE8C
1RN14CS010 CSE7A
1RN14CS025 CSE7A
1RN14CS032 CSE7A
1RN15CS011 CSE4A
1RN15CS029 CSE4A
1RN15CS045 CSE4B
1RN15CS091 CSE4C
1RN16CS045 CSE3A
1RN16CS088 CSE3B
1RN16CS122 CSE3C

14 rows selected.
```

| SUBCODE | TITLE | SEM | CREDITS |
|---|---|---|---|
| 10CS81 | ACA | 8 | 4 |
| 10CS82 | SSM | 8 | 4 |
| 10CS83 | NM | 8 | 4 |
| 10CS84 | CC | 8 | 4 |
| 10CS85 | PW | 8 | 4 |
| 10CS71 | OOAD | 7 | 4 |
| 10CS72 | ECS | 7 | 4 |
| 10CS73 | PTW | 7 | 4 |
| 10CS74 | DWDM | 7 | 4 |
| 10CS75 | JAVA | 7 | 4 |
| 10CS76 | SAN | 7 | 4 |
| 15CS51 | ME | 5 | 4 |
| 15CS52 | CN | 5 | 4 |
| 15CS53 | DBMS | 5 | 4 |
| 15CS54 | ATC | 5 | 4 |
| 15CS55 | JAVA | 5 | 3 |
| 15CS56 | AI | 5 | 3 |
| 15CS41 | M4 | 4 | 4 |
| 15CS42 | SE | 4 | 4 |
| 15CS43 | DAA | 4 | 4 |
| 15CS44 | MPMC | 4 | 4 |
| 15CS45 | OOC | 4 | 3 |
| 15CS46 | DC | 4 | 3 |
| 15CS31 | M3 | 3 | 4 |
| 15CS32 | ADE | 3 | 4 |
| 15CS33 | DSA | 3 | 4 |
| 15CS34 | CO | 3 | 4 |
| 15CS35 | USP | 3 | 3 |
| 15CS36 | DMS | 3 | 3 |

```
SQL> SELECT * FROM IAMARKS;
```

| USN | SUBCODE | SSID | TEST1 | TEST2 | TEST3 | FINALIA |
|---|---|---|---|---|---|---|
| 1RN13CS091 | 10CS81 | CSE8C | 15 | 16 | 18 | |
| 1RN13CS091 | 10CS82 | CSE8C | 12 | 19 | 14 | |
| 1RN13CS091 | 10CS83 | CSE8C | 19 | 15 | 20 | |
| 1RN13CS091 | 10CS84 | CSE8C | 20 | 16 | 19 | |
| 1RN13CS091 | 10CS85 | CSE8C | 15 | 15 | 12 | |

**Queries:**

1. **List all the student details studying in fourth semester 'C' section.**

```
SELECT S.*, SS.SEM, SS.SEC
FROM STUDENT S, SEMSEC SS, CLASS C
WHERE S.USN = C.USN AND
SS.SSID = C.SSID AND
SS.SEM = 4 AND SS.SEC='C';
```

| USN | SNAME | ADDRESS | PHONE | G | SEM | S |
|---|---|---|---|---|---|---|
| 1RN15CS091 | SANTOSH | MANGALURU | 8812332201 | M | 4 | C |

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

```
SELECT SS.SEM, SS.SEC, S.GENDER, COUNT (S.GENDER) AS COUNT
FROM STUDENT S, SEMSEC SS, CLASS C
WHERES.USN = C.USN AND
SS.SSID = C.SSID
GROUP BY SS.SEM, SS.SEC, S.GENDER
ORDER BY SEM;
```

| SEM | S | G | COUNT |
|---|---|---|---|
| 3 | A | M | 1 |
| 3 | B | F | 1 |
| 3 | C | M | 1 |
| 4 | A | F | 1 |
| 4 | A | M | 1 |
| 4 | B | M | 1 |
| 4 | C | M | 1 |
| 7 | A | F | 1 |
| 7 | A | M | 2 |
| 8 | A | F | 1 |
| 8 | A | M | 1 |
| 8 | B | F | 1 |
| 8 | C | F | 1 |

3. **Create a view of Test1 marks of student USN '1BI15CS101' in allsubjects.**

```
CREATE VIEW STU_TEST1_MARKS_VIEW
AS
SELECT TEST1, SUBCODE
FROM IAMARKS
WHERE USN = '1RN13CS091';
```

| TEST1 | SUBCODE |
|---|---|
| 15 | 10CS81 |
| 12 | 10CS82 |
| 19 | 10CS83 |
| 20 | 10CS84 |
| 15 | 10CS85 |

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

```
  CREATE OR REPLACE PROCEDURE  AVGMARKS
  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    NUMBER;
  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;
/
```

**Note:** Before execution of PL/SQL procedure, IAMARKS table contents are:

SELECT * FROM IAMARKS;

```
SQL> SELECT * FROM IAMARKS;

USN         SUBCODE   SSID       TEST1      TEST2      TEST3    FINALIA
---------- -------- ----- ---------- ---------- ---------- ----------
1RN13CS091 10CS81    CSE8C         15         16         18
1RN13CS091 10CS82    CSE8C         12         19         14
1RN13CS091 10CS83    CSE8C         19         15         20
1RN13CS091 10CS84    CSE8C         20         16         19
1RN13CS091 10CS85    CSE8C         15         15         12
```

**Below SQL code is to invoke the PL/SQL stored procedure from the command line:**

```
BEGIN
AVGMARKS;
END;
```

```
SQL> select * from IAMARks;

USN         SUBCODE   SSID       TEST1      TEST2      TEST3    FINALIA
---------- -------- ----- ---------- ---------- ---------- ----------
1RN13CS091 10CS81    CSE8C         15         16         18         17
1RN13CS091 10CS82    CSE8C         12         19         14         17
1RN13CS091 10CS83    CSE8C         19         15         20         20
1RN13CS091 10CS84    CSE8C         20         16         19         20
1RN13CS091 10CS85    CSE8C         15         15         12         15
```

**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.**

```
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 ANDSUB.SUBCODE
= IA.SUBCODE AND SUB.SEM = 8;
```

```
USN         SNAME                ADDRESS                   PHONE G CAT
---------- -------------------- ------------------------- ---------- - -----------
1RN13CS091 TEESHA               BENGALURU                 7712312312 F OutStanding
1RN13CS091 TEESHA               BENGALURU                 7712312312 F OutStanding
1RN13CS091 TEESHA               BENGALURU                 7712312312 F OutStanding
1RN13CS091 TEESHA               BENGALURU                 7712312312 F OutStanding
1RN13CS091 TEESHA               BENGALURU                 7712312312 F Average
```

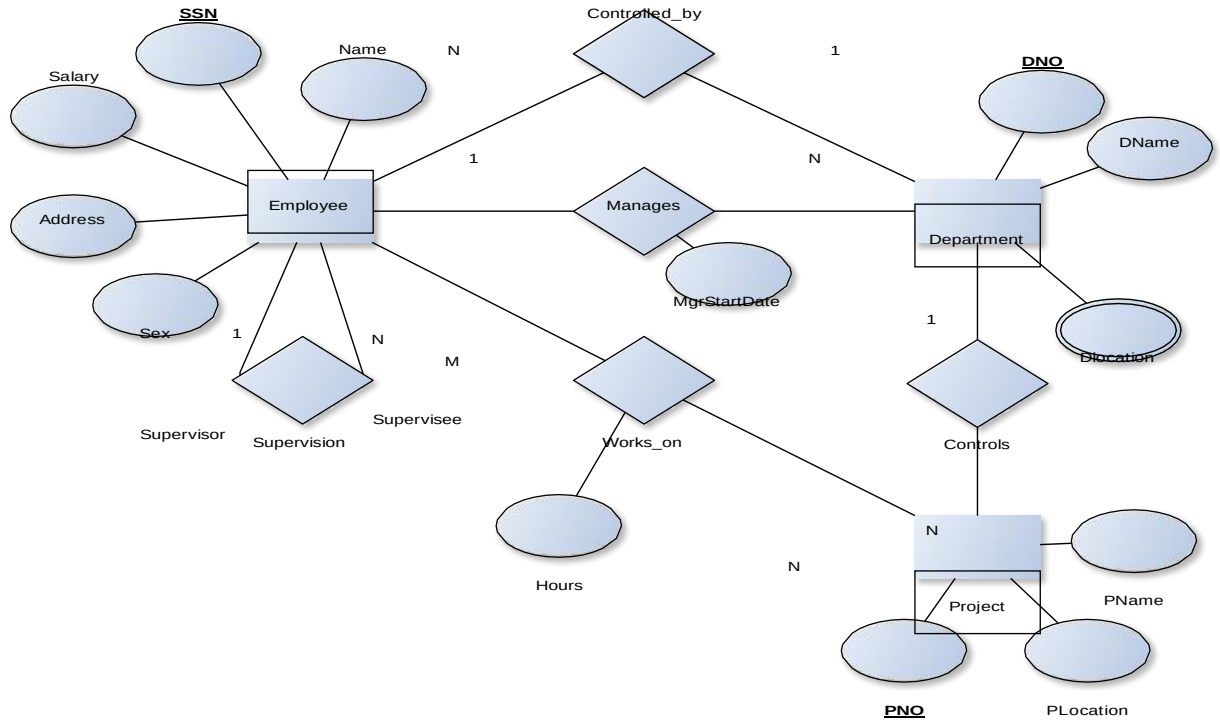
## PROGRAM 5

**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**

6. **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.**
7. **Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.**
8. **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**
9. **Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). 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.**

**Entity-Relationship Diagram**



**Schema Diagram**

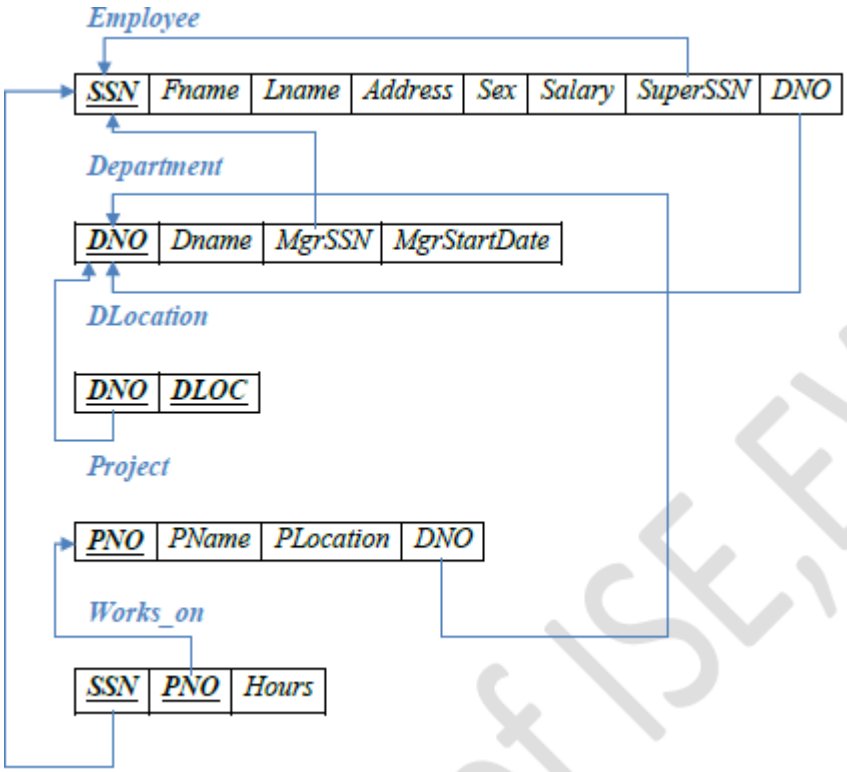



**Table Creation**

```
CREATE TABLE DEPARTMENT
(DNO VARCHAR2 (20) PRIMARY KEY,
DNAME VARCHAR2 (20),
MGRSTARTDATE DATE);

CREATE TABLE EMPLOYEE
(SSN VARCHAR2 (20) PRIMARY KEY,
FNAME VARCHAR2 (20),
LNAME VARCHAR2 (20),
ADDRESS VARCHAR2 (20),
SEX CHAR (1),
SALARY INTEGER,
SUPERSSN REFERENCES EMPLOYEE (SSN),
DNO REFERENCES DEPARTMENT (DNO));
```

**NOTE:** Once DEPARTMENT and EMPLOYEE tables are created we must alter department table to add foreign constraint MGRSSN using sql command

```
ALTER TABLE DEPARTMENT
ADD MGRSSN REFERENCES EMPLOYEE (SSN);

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

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

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

**Table Descriptions**

```
SQL> DESC EMPLOYEE;
 Name
 -----------------------------------------------------------------
 SSN
 FNAME
 LNAME
 ADDRESS
 SEX
 SALARY
 SUPERSSN
 DNO

SQL> DESC DEPARTMENT;
 Name
 -----------------------------------------------------
 DNO
 DNAME
 MGRSTARTDATE
 MGRSSN
```

```
SQL> DESC DLOCATION;
 Name
 -------------------------
 DLOC
 DNO


SQL> DESC PROJECT;
 Name
 -------------------------
 PNO
 PNAME
 PLOCATION
 DNO

SQL> DESC WORKS_ON;
 Name
 ------------------------------------------------
 HOURS
 SSN
 PNO
```

**Insertion of values to tables**

INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSECE01’,’JOHN’,’SCOTT’,’BANGALORE’,’M’, 450000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSCSE01’,’JAMES’,’SMITH’,’BANGALORE’,’M’, 500000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSCSE02’,’HEARN’,’BAKER’,’BANGALORE’,’M’, 700000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSCSE03’,’EDWARD’,’SCOTT’,’MYSORE’,’M’, 500000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSCSE04’,’PAVAN’,’HEGDE’,’MANGALORE’,’M’, 650000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSCSE05’,’GIRISH’,’MALYA’,’MYSORE’,’M’, 450000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSCSE06’,’NEHA’,’SN’,’BANGALORE’,’F’, 800000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSACC01’,’AHANA’,’K’,’MANGALORE’,’F’, 350000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSACC02’,’SANTHOSH’,’KUMAR’,’MANGALORE’,’M’, 300000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSISE01’,’VEENA’,’M’,’MYSORE’,’M’, 600000);
INSERT INTO EMPLOYEE (SSN, FNAME, LNAME, ADDRESS, SEX, SALARY) VALUES (‘RNSIT01’,’NAGESH’,’HR’,’BANGALORE’,’M’, 500000);

```
INSERT INTO DEPARTMENT VALUES ('1','ACCOUNTS','01-JAN-01','RNSACC02');
INSERT INTO DEPARTMENT VALUES ('2','IT','01-AUG-16','RNSIT01');
INSERT INTO DEPARTMENT VALUES ('3','ECE','01-JUN-08','RNSECE01');
INSERT INTO DEPARTMENT VALUES ('4','ISE','01-AUG-15','RNSISE01');
INSERT INTO DEPARTMENT VALUES ('5','CSE','01-JUN-02','RNSCSE05');
```

**Note: update entries of employee table to fill missing fields SUPERSSN and DNO**

```
UPDATE EMPLOYEE SET
SUPERSSN=NULL, DNO='3'
WHERE SSN='RNSECE01';

UPDATE EMPLOYEE SET
SUPERSSN='RNSCSE02', DNO='5'
WHERE SSN='RNSCSE01';

UPDATE EMPLOYEE SET
SUPERSSN='RNSCSE03', DNO='5'
WHERE SSN='RNSCSE02';

UPDATE EMPLOYEE SET
SUPERSSN='RNSCSE04', DNO='5'
WHERE SSN='RNSCSE03';

UPDATE EMPLOYEE SET DNO='5',
SUPERSSN='RNSCSE05' WHERE
SSN='RNSCSE04';

UPDATE EMPLOYEE SET DNO='5',
SUPERSSN='RNSCSE06' WHERE
SSN='RNSCSE05';

UPDATE EMPLOYEE SET
DNO='5', SUPERSSN=NULL
WHERE SSN='RNSCSE06';

UPDATE EMPLOYEE SET DNO='1',
SUPERSSN='RNSACC02' WHERE
SSN='RNSACC01';
```

```
UPDATE EMPLOYEE SET
DNO='1', SUPERSSN=NULL
WHERE SSN='RNSACC02';

UPDATE EMPLOYEE SET
DNO='4', SUPERSSN=NULL
WHERE SSN='RNSISE01';

UPDATE EMPLOYEE SET
DNO='2', SUPERSSN=NULL
WHERE SSN='RNSIT01';

INSERT INTO DLOCATION VALUES ('BANGALORE', '1');
INSERT INTO DLOCATION VALUES ('BANGALORE', '2');
INSERT INTO DLOCATION VALUES ('BANGALORE', '3');
INSERT INTO DLOCATION VALUES ('MANGALORE', '4');
INSERT INTO DLOCATION VALUES ('MANGALORE', '5');

INSERT INTO PROJECT VALUES (100,'IOT','BANGALORE','5'); INSERT
INTO PROJECT VALUES (101,'CLOUD','BANGALORE','5'); INSERT INTO
PROJECT VALUES (102,'BIGDATA','BANGALORE','5'); INSERT INTO
PROJECT VALUES (103,'SENSORS','BANGALORE','3');
INSERT INTO PROJECT VALUES (104,'BANK MANAGEMENT','BANGALORE','1'); INSERT
INTO PROJECT VALUES (105,'SALARY MANAGEMENT','BANGALORE','1'); INSERT
INTO PROJECT VALUES (106,'OPENSTACK','BANGALORE','4');
INSERT INTO PROJECT VALUES (107,'SMART CITY','BANGALORE','2');

INSERT INTO WORKS_ON VALUES (4, 'RNSCSE01', 100);
INSERT INTO WORKS_ON VALUES (6, 'RNSCSE01', 101);
INSERT INTO WORKS_ON VALUES (8, 'RNSCSE01', 102);
INSERT INTO WORKS_ON VALUES (10, 'RNSCSE02', 100);
INSERT INTO WORKS_ON VALUES (3, 'RNSCSE04', 100);
INSERT INTO WORKS_ON VALUES (4, 'RNSCSE05', 101);
INSERT INTO WORKS_ON VALUES (5, 'RNSCSE06', 102);
INSERT INTO WORKS_ON VALUES (6, 'RNSCSE03', 102);
INSERT INTO WORKS_ON VALUES (7, 'RNSECE01', 103);
INSERT INTO WORKS_ON VALUES (5, 'RNSACC01', 104);
INSERT INTO WORKS_ON VALUES (6, 'RNSACC02', 105);
INSERT INTO WORKS_ON VALUES (4, 'RNSISE01', 106);
INSERT INTO WORKS_ON VALUES (10, 'RNSIT01', 107);
```

SELECT * FROM EMPLOYEE;

| SSN | FNAME | LNAME | ADDRESS | S | SALARY | SUPERSSN | DNO |
|---|---|---|---|---|---|---|---|
| RNSECE01 | JOHN | SCOTT | BANGALORE | M | 450000 | | 3 |
| RNSCSE01 | JAMES | SMITH | BANGALORE | M | 500000 | RNSCSE02 | 5 |
| RNSCSE02 | HEARN | BAKER | BANGALORE | M | 700000 | RNSCSE03 | 5 |
| RNSCSE03 | EDWARD | SCOTT | MYSORE | M | 500000 | RNSCSE04 | 5 |
| RNSCSE04 | PAVAN | HEGDE | MANGALORE | M | 650000 | RNSCSE05 | 5 |
| RNSCSE05 | GIRISH | MALYA | MYSORE | M | 450000 | RNSCSE06 | 5 |
| RNSCSE06 | NEHA | SN | BANGALORE | F | 800000 | | 5 |
| RNSACC01 | AHANA | K | MANGALORE | F | 350000 | RNSACC02 | 1 |
| RNSACC02 | SANTHOSH | KUMAR | MANGALORE | M | 300000 | | 1 |
| RNSISE01 | VEENA | M | MYSORE | M | 600000 | | 4 |
| RNSIT01 | NAGESH | HR | BANGALORE | M | 500000 | | 2 |

SELECT * FROM DEPARTMENT;

```
SQL> SELECT * FROM DEPARTMENT;
```

| DNO | DNAME | MGRSTARTD | MGRSSN |
|---|---|---|---|
| 1 | ACCOUNTS | 01-JAN-01 | RNSACC02 |
| 2 | IT | 01-AUG-16 | RNSIT01 |
| 3 | ECE | 01-JUN-08 | RNSECE01 |
| 4 | ISE | 01-AUG-15 | RNSISE01 |
| 5 | CSE | 01-JUN-02 | RNSCSE05 |

SELECT * FROM DLOCATION;

| DLOC | DNO |
|---|---|
| BANGALORE | 1 |
| BANGALORE | 2 |
| BANGALORE | 3 |
| MANGALORE | 4 |
| MANGALORE | 5 |

SELECT * FROM PROJECT;

| PNO | PNAME | PLOCATION | DNO |
|---|---|---|---|
| 100 | IOT | BANGALORE | 5 |
| 101 | CLOUD | BANGALORE | 5 |
| 102 | BIGDATA | BANGALORE | 5 |
| 103 | SENSORS | BANGALORE | 3 |
| 104 | BANK MANAGEMENT | BANGALORE | 1 |
| 105 | SALARY MANAGEMENT | BANGALORE | 1 |
| 106 | OPENSTACK | BANGALORE | 4 |
| 107 | SMART CITY | BANGALORE | 2 |

SELECT * FROM WORKS_ON;

| HOURS | SSN | PNO |
|---|---|---|
| 4 | RNSCSE01 | 100 |
| 6 | RNSCSE01 | 101 |
| 8 | RNSCSE01 | 102 |
| 10 | RNSCSE02 | 100 |
| 3 | RNSCSE04 | 100 |
| 4 | RNSCSE05 | 101 |
| 5 | RNSCSE06 | 102 |
| 6 | RNSCSE03 | 102 |
| 7 | RNSECE01 | 103 |
| 5 | RNSACC01 | 104 |
| 6 | RNSACC02 | 105 |
| 4 | RNSISE01 | 106 |
| 10 | RNSIT01 | 107 |

**Queries:**

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.**

```
(SELECT DISTINCT P.PNO
FROM PROJECT P, DEPARTMENT D, EMPLOYEE E
WHERE E.DNO=D.DNO
AND D.MGRSSN=E.SSN
AND E.LNAME='SCOTT')
UNION
(SELECT DISTINCT P1.PNO
FROM PROJECT P1, WORKS_ON W, EMPLOYEE E1
WHERE P1.PNO=W.PNO
AND E1.SSN=W.SSN
AND E1.LNAME='SCOTT');
```

| PNO |
|---|
| 100 |
| 101 |
| 102 |
| 103 |
| 104 |
| 105 |
| 106 |
| 107 |

**2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.**

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

| FNAME | LNAME | INCR_SAL |
|---|---|---|
| JAMES | SMITH | 550000 |
| HEARN | BAKER | 770000 |
| PAVAN | HEGDE | 715000 |

**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**

```
SELECT SUM (E.SALARY), MAX (E.SALARY), MIN (E.SALARY), AVG
(E.SALARY)
FROM EMPLOYEE E, DEPARTMENT D
WHERE E.DNO=D.DNO
AND D.DNAME='ACCOUNTS';
```

| SUM(E.SALARY) | MAX(E.SALARY) | MIN(E.SALARY) | AVG(E.SALARY) |
|---|---|---|---|
| 650000 | 350000 | 300000 | 325000 |

**4. Retrieve the name of each employee who works on all the projects Controlled by department number 5 (use NOT EXISTS operator).**

```
SELECT E.FNAME, E.LNAME
FROM EMPLOYEE E
WHERE NOT EXISTS((SELECT PNO
                  FROM PROJECT
                  WHERE DNO='5')
                  MINUS (SELECT PNO
                  FROM WORKS_ON
                  WHERE E.SSN=SSN));
```

| FNAME | LNAME |
|---|---|
| JAMES | SMITH |

**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.**

```
SELECT D.DNO, COUNT (*)
FROM DEPARTMENT D, EMPLOYEE E
WHERE D.DNO=E.DNO
AND E.SALARY>600000
AND D.DNO IN (SELECT E1.DNO
        FROM EMPLOYEE E1
        GROUP BY E1.DNO HAVING
        COUNT (*)>5)
GROUP BY D.DNO;
```

| DNO | COUNT(*) |
|---|---|
| 5 | 3 |