LAB MANUAL

DBMS LABORATORY WITH MINI PROJECT [15CSL58]

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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.

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.

	2. Find the name and numbers of all salesman who had more than one customer. 3. List all the salesman 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.	
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.	37
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.	45

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 controlledby department 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.	57

INTRODUCTION TO SQL

Pronounced as SEQUEL: Structured English QUERY Language

- Pure non-procedural query language
- Designed and developed by IBM, Implemented by Oracle
- 1978 System/R IBM- 1st Relational DBMS
- 1979 Oracle and Ingres
- 1982 SQL/DS and DB2 IBM
- Accepted by both ANSI + ISO as **Standard Query Language** for any RDBMS
- SQL86 (SQL1) : first by ANSI and ratified by ISO (SQL-87), minor revision on 89 (SQL-89)
- SQL92 (SQL2) : major revision
- SQL99 (SQL3) : add recursive query, trigger, some OO features, and non-scholar type
- SQL2003 : XML, Window functions, and sequences (Not free)
- Supports all the three sublanguages of DBMS: **DDL, DML, DCL**
- Supports Aggregate functions, String Manipulation functions, Set theory operations, Date Manipulation functions, rich set of operators (IN, BETWEEN, LIKE, IS NULL, EXISTS)
- Supports REPORT writing features and Forms for designing GUI based applications

DATA DEFINITION, CONSTRAINTS, AND SCHEMA CHANGES

Used to CREATE, ALTER, and DROP the descriptions of the database tables (relations)

Data Definition in SQL

CREATE, ALTER and DROP

table	relation
row	tuple
column	attribute

DATA TYPES

- Numeric: NUMBER, NUMBER(s,p), INTEGER, INT, FLOAT, DECIMAL
- Character: CHAR(n), VARCHAR(n), VARCHAR2(n), CHAR VARYING(n)
- Bit String: BLOB, CLOB
- Boolean: true, false, and null
- Date and Time: DATE (YYYY-MM-DD) TIME(HH:MM:SS)
- Timestamp: DATE + TIME
- USER Defined types

CREATE SCHEMA

Specifies a new database schema by giving it a name

Ex: CREATE SCHEMA COMPANY AUTHORIZATION Jsmith;

CREATE TABLE

- Specifies a new base relation by giving it a name, and specifying each of its attributes and their data types

  Syntax of CREATE Command:

  CREATE TABLE <*table name*> (<Attribute *A*1> <Data Type *D*1> [< Constarints>],
  <Attribute *A*2> <Data Type *D*2> [< Constarints>],
  …….
  <Attribute *A*n> <Data Type *D*n> [< Constarints>],
  [<integrity-constraint1>, <integrity-constraint k>]);
  - A constraint NOT NULL may be specified on an attribute
  A constraint NOT NULL may be specified on an attribute
  Ex: CREATE TABLE DEPARTMENT (
  DNAME VARCHAR(10) NOT NULL,
   DNUMBER INTEGER NOT NULL,
  MGRSSN CHAR(9), MGRSTARTDATE CHAR(9));

- Specifying the unique, primary key attributes, secondary keys, and referential integrity constraints (foreign keys).
  Ex: CREATE TABLE DEPT (
  DNAME VARCHAR(10) NOT NULL,
  DNUMBER INTEGER NOT NULL,
  MGRSSN CHAR(9),

```
MGRSTARTDATE CHAR(9),
PRIMARY KEY (DNUMBER),
UNIQUE (DNAME),
FOREIGN KEY (MGRSSN) REFERENCES EMP(SSN));
```

- We can specify RESTRICT, CASCADE, SET NULL or SET DEFAULT on referential integrity constraints (foreign keys)

  ```
  Ex: CREATE TABLE DEPT (
  DNAME VARCHAR(10) NOT NULL,
  DNUMBER INTEGER NOT NULL,
  MGRSSN CHAR(9), MGRSTARTDATE CHAR(9),
  PRIMARY KEY (DNUMBER),
  UNIQUE (DNAME),
  FOREIGN KEY (MGRSSN) REFERENCES EMP
  ON DELETE SET DEFAULT ON UPDATE CASCADE);
  ```

DROP TABLE

- Used to remove a relation (base table) and its definition.
- The relation can no longer be used in queries, updates, or any other commands since its description no longer exists

Example: DROP TABLE DEPENDENT;

ALTER TABLE:

- Used to add an attribute to/from one of the base relations drop constraint -- The new attribute will have NULLs in all the tuples of the relation right after the command is executed; hence, the NOT NULL constraint is *not allowed* for such an attribute.

  Example: ALTER TABLE EMPLOYEE ADD JOB VARCHAR2 (12);
- The database users must still enter a value for the new attribute JOB for each EMPLOYEE tuple. This can be done using the UPDATE command.

DROP A COLUMN (AN ATTRIBUTE)

- ALTER TABLE COMPANY.EMPLOYEE DROP ADDRESS CASCADE; All constraints and views that reference the column are dropped automatically, along with the column.
- ALTER TABLE COMPANY.EMPLOYEE DROP ADDRESS RESTRICT;
  Successful if no views or constraints reference the column.
- ALTER TABLE COMPANY.DEPARTMENT ALTER MGRSSN DROP DEFAULT;
- ALTER TABLE COMPANY.DEPARTMENT ALTER MGRSSN SET DEFAULT "333445555";

BASIC QUERIES IN SQL

- SQL has one basic statement for retrieving information from a database; the SLELECT statement
- This is *not the same as* the SELECT operation of the relational algebra
- Important distinction between SQL and the formal relational model;
- SQL allows a table (relation) to have two or more tuples that are identical in all their attribute values
- Hence, an SQL relation (table) is a *multi-set* (sometimes called a bag) of tuples; it is *not* a set of tuples
- SQL relations can be constrained to be sets by using the CREATE UNIQUE INDEX command, or by using the DISTINCT option
- Basic form of the SQL SELECT statement is called a *mapping* of a *SELECT-FROM-WHERE block*

  SELECT <attribute list> FROM <table list> WHERE <condition>
- <attribute list> is a list of attribute names whose values are to be retrieved by the query
- <table list > is a list of the relation names required to process the query
- <condition> is a conditional (Boolean) expression that identifies the tuples to be retrieved by the query

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:

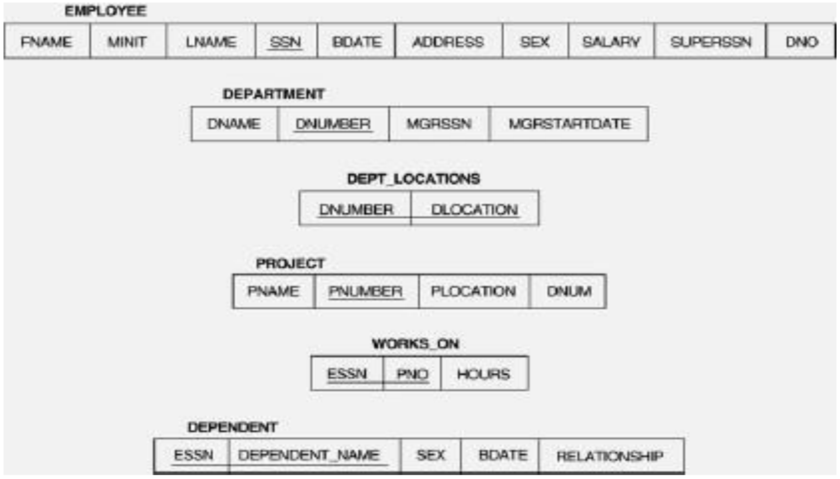
Example of a simple query on one relation

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

DEPARTMENT

DNAME	DNUMBER	MGRSSN	MGRSTARTDATE

DEPT_LOCATIONS

DNUMBER	DLOCATION

PROJECT

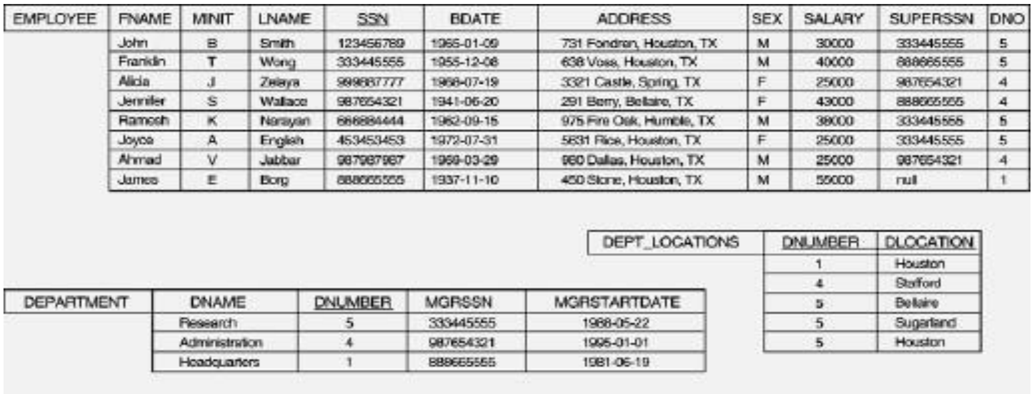
PNAME	PNUMBER	PLOCATION	DNUM

WORKS_ON

ESSN	PNO	HOURS

DEPENDENT

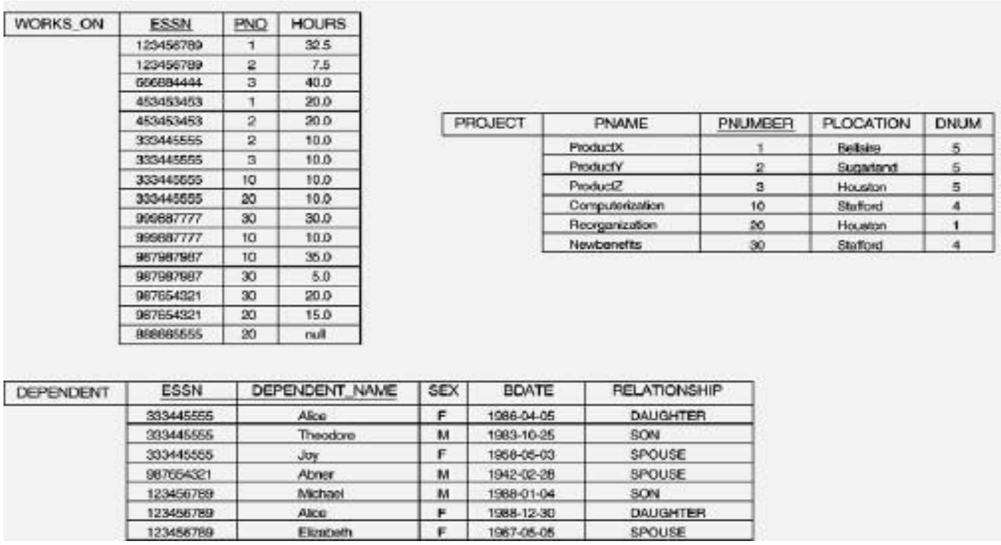
ESSN	DEPENDENT_NAME	SEX	BDATE	RELATIONSHIP



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 FROM 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 the FROM-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 may result

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 than on 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 characters are 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 arbitrary character.

```
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
WHERE SSN=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 new values
- 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 and take 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.

EXPERIMENT 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 with a 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

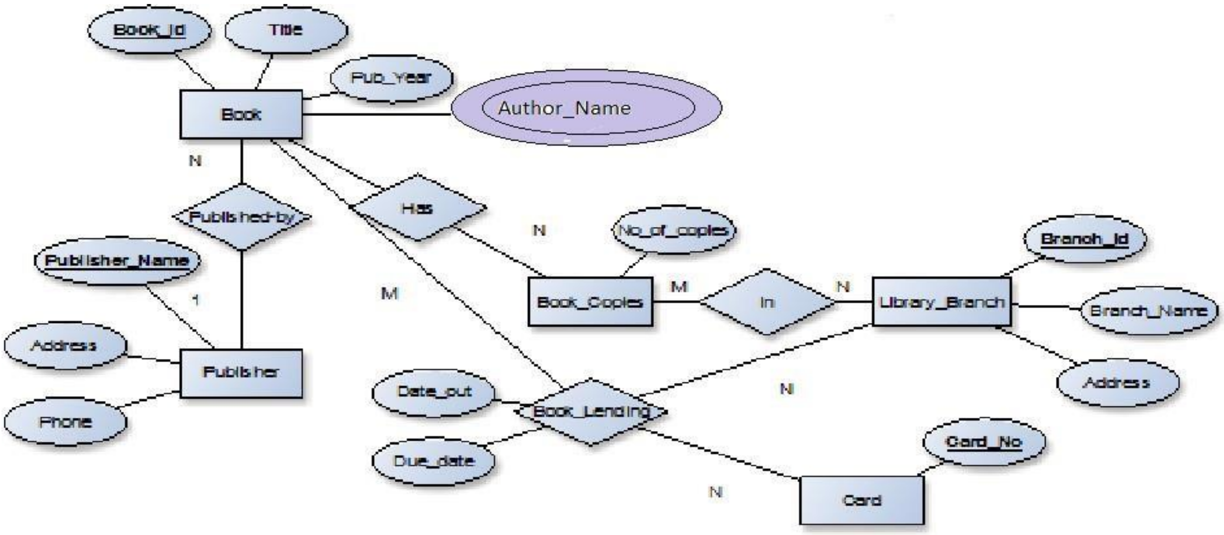
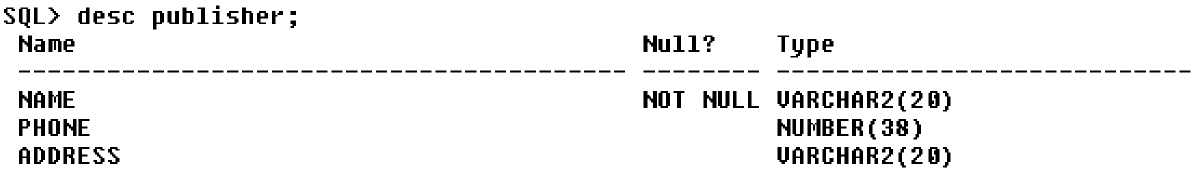


Table Creation

```
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 CARD
(CARD_NO INTEGER PRIMARY KEY);

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 REFERENCES CARD (CARD_NO) ON DELETE CASCADE,
PRIMARY KEY (BOOK_ID, BRANCH_ID, CARD_NO));
```

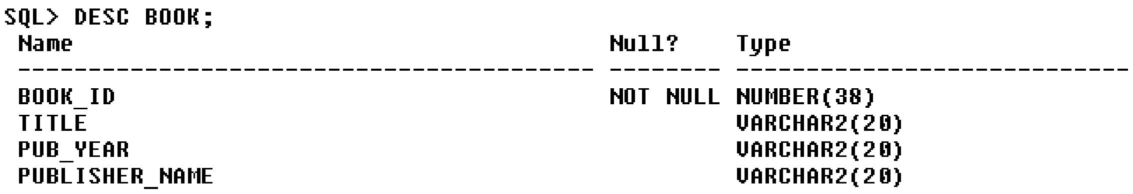
Table Descriptions

DESC PUBLISHER;



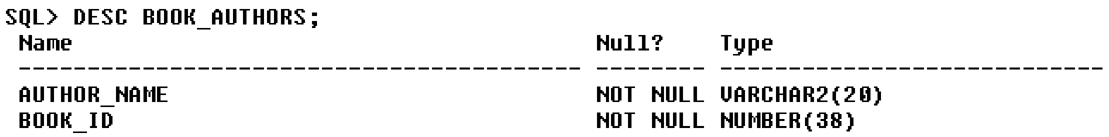
```
SQL> desc publisher;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 NAME                                      NOT NULL VARCHAR2(20)
 PHONE                                              NUMBER(38)
 ADDRESS 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

DESC BOOK;



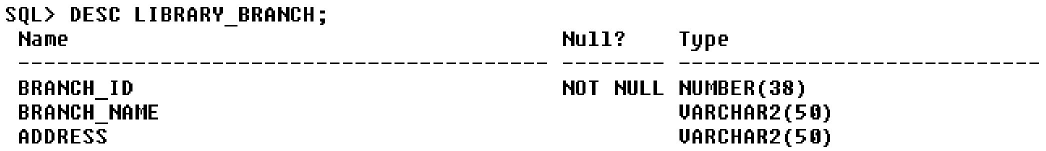
```
SQL> DESC BOOK;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 BOOK_ID                                   NOT NULL NUMBER(38)
 TITLE                                              VARCHAR2(20)
 PUB_YEAR     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

DESC BOOK_AUTHORS;



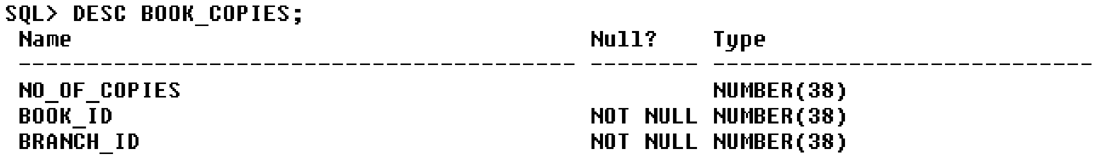
```
SQL> DESC BOOK_AUTHORS;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 AUTHOR_NAME                               NOT NULL VARCHAR2(20)
 BOOK_ID                                   NOT NULL NUMBER(38)
```

DESC LIBRARY_BRANCH;



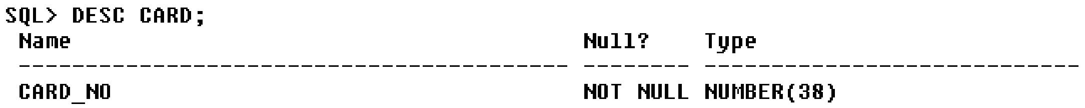
```
SQL> DESC LIBRARY_BRANCH;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 BRANCH_ID                                 NOT NULL NUMBER(38)
 BRANCH_NAME                                        VARCHAR2(50)
 ADDRESS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

DESC BOOK_COPIES;



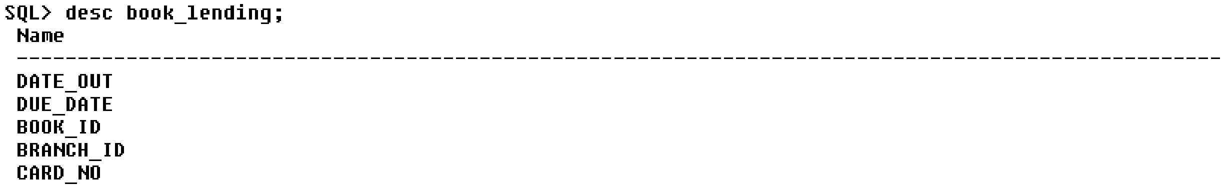
```
SQL> DESC BOOK_COPIES;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 NO_OF_COPIES                                       NUMBER(38)
 BOOK_ID                                   NOT NULL NUMBER(38)
 BRANCH_ID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

DESC CARD;



```
SQL> DESC CARD;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 CARD_NO                                   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’);

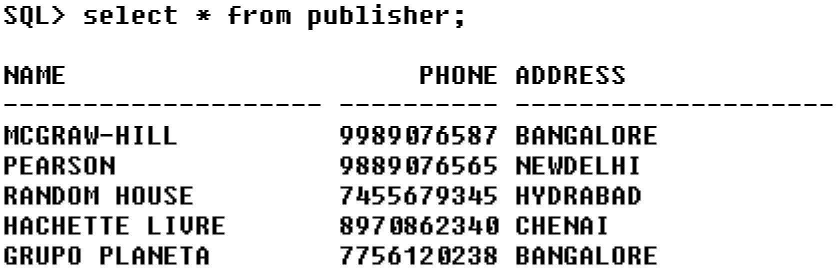
INSERT INTO BOOK_AUTHORS VALUES (’NAVATHE’, 1);
INSERT INTO BOOK_AUTHORS VALUES (’NAVATHE’, 2);
INSERT INTO BOOK_AUTHORS VALUES (’TANENBAUM’, 3);
INSERT INTO BOOK_AUTHORS VALUES (’EDWARD ANGEL’, 4);
INSERT INTO BOOK_AUTHORS VALUES (’GALVIN’, 5);

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 CARD VALUES (100);

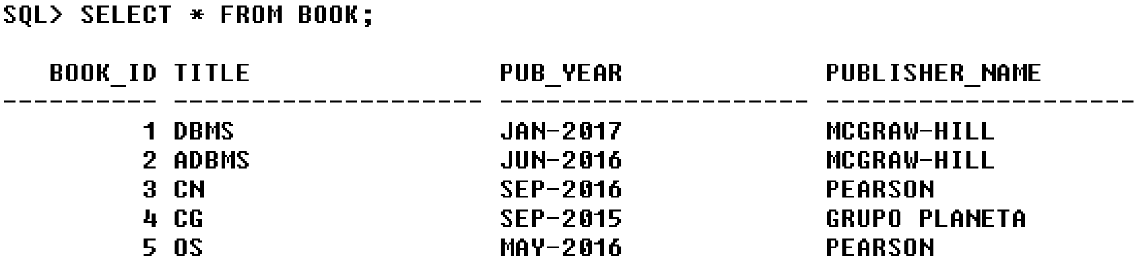
```
INSERT INTO CARD VALUES (101);
INSERT INTO CARD VALUES (102);
INSERT INTO CARD VALUES (103);
INSERT INTO CARD VALUES (104);

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;



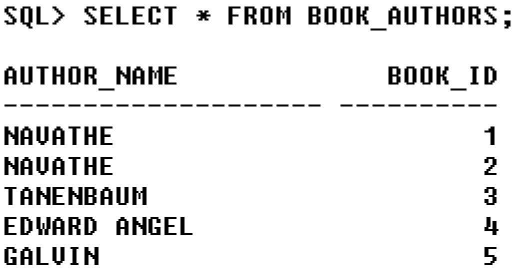
```
SQL> select * from publisher;

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

SELECT * FROM BOOK;



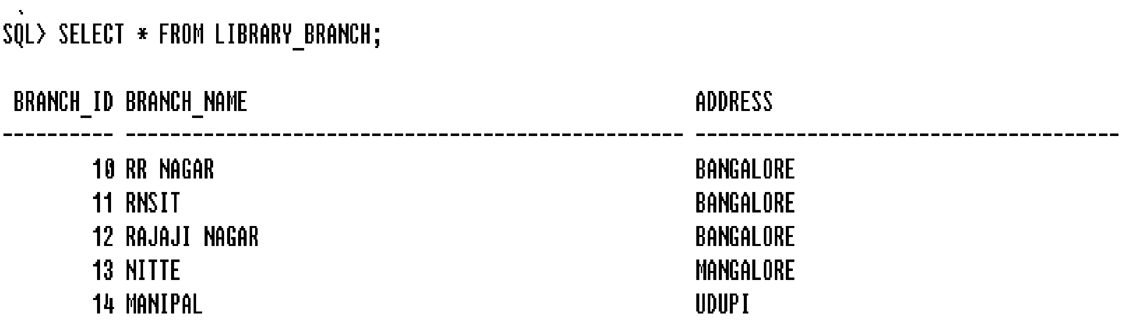
```
SQL> SELECT * FROM BOOK;

   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
```

SELECT * FROM BOOK_AUTHORS;



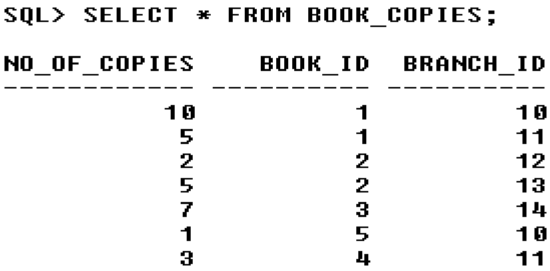
```
SQL> SELECT * FROM BOOK_AUTHORS;

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

SELECT * FROM LIBRARY_BRANCH;



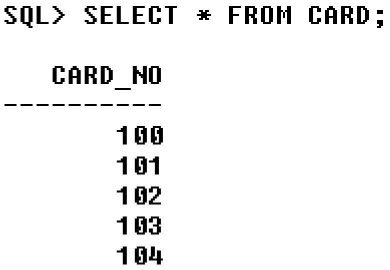
```
SQL> SELECT * FROM LIBRARY_BRANCH;

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

SELECT * FROM BOOK_COPIES;



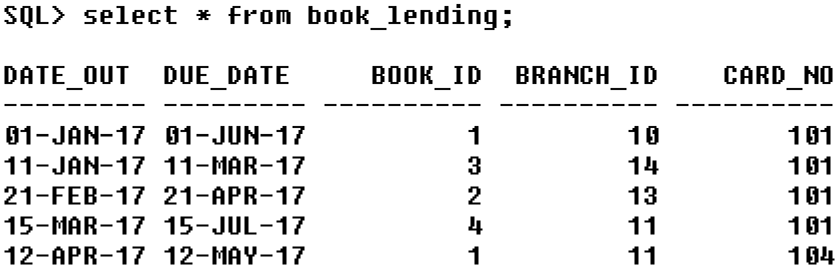
```
SQL> SELECT * FROM BOOK_COPIES;

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
```

SELECT * FROM CARD;



```
SQL> SELECT * FROM CARD;

   CARD_NO
----------
       100
       101
       102
       103
       104
```

SELECT * FROM BOOK_LENDING;

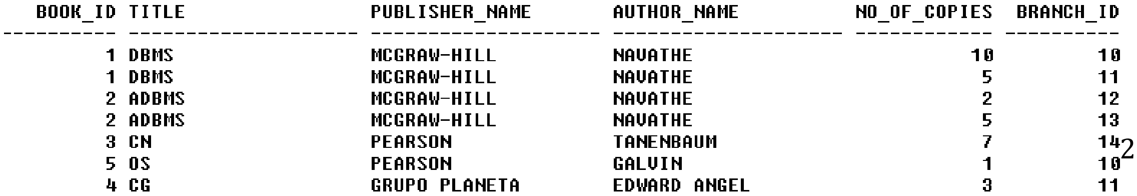


```
SQL> select * from book_lending;

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.**

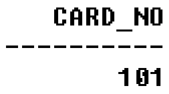
SELECT B.BOOK_ID, B.TITLE, B.PUBLISHER_NAME, A.AUTHOR_NAME, C.NO_OF_COPIES, L.BRANCH_ID
FROM BOOK B, BOOK_AUTHORS A, BOOK_COPIES C, LIBRARY_BRANCH L
WHERE B.BOOK_ID=A.BOOK_ID
AND B.BOOK_ID=C.BOOK_ID
AND L.BRANCH_ID=C.BRANCH_ID;



```
   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.**

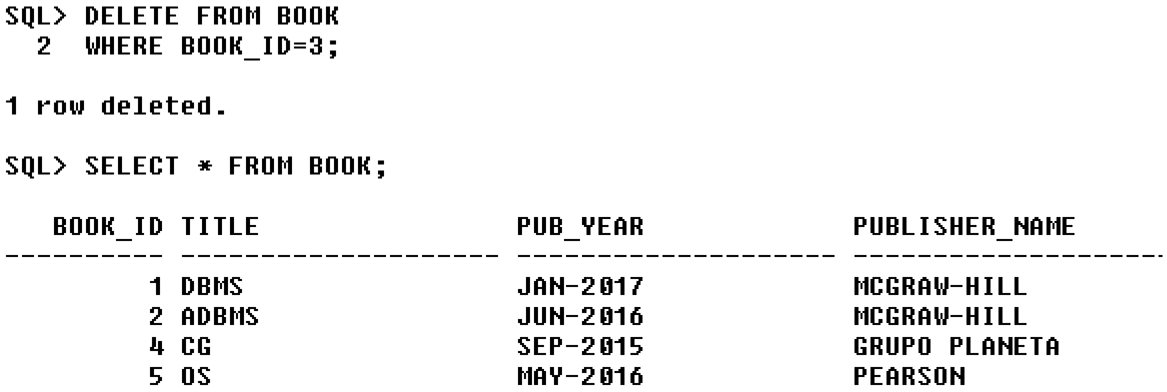
```
SELECT CARD_NO FROM BOOK_LENDING
WHERE DATE_OUT BETWEEN ’01-JAN-2017’ AND ’01-JUL-2017’
GROUP BY CARD_NO
HAVING COUNT (*)>3;
```



```
   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;
```

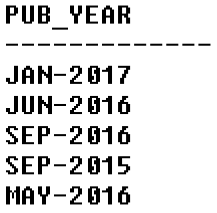


```
SQL> DELETE FROM BOOK
  2  WHERE BOOK_ID=3;

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.**

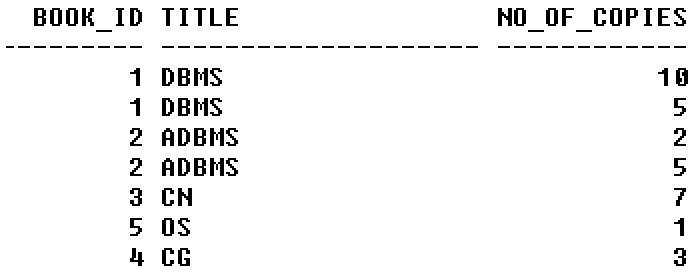
```
CREATE VIEW V_PUBLICATION AS
SELECT PUB_YEAR
FROM BOOK;
```



```
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
```

EXPERIMENT 2

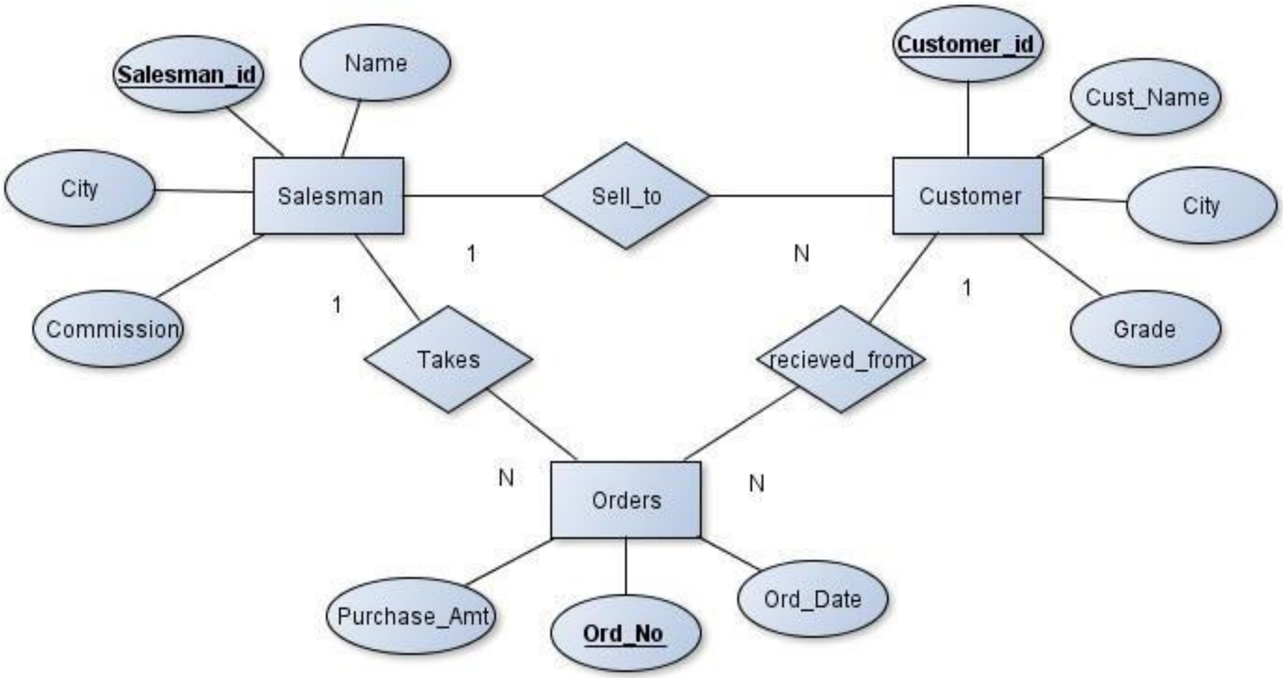
2. Consider the following schema for Order Database:

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



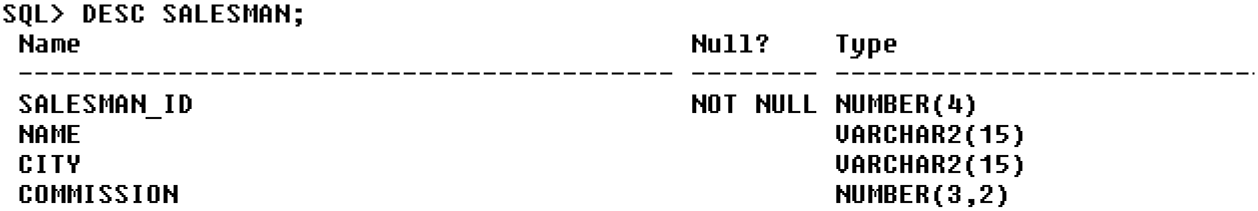
Schema Diagram

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);
```

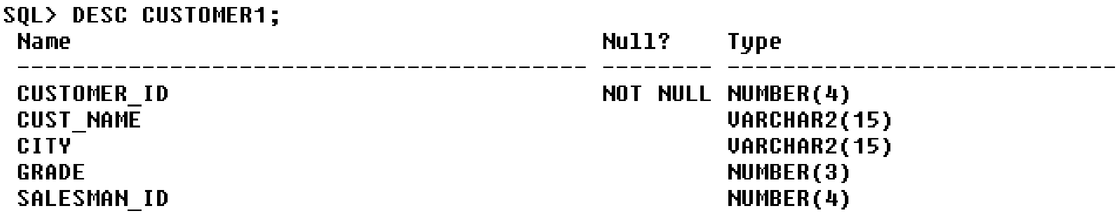
Table Descriptions

DESC SALESMAN;



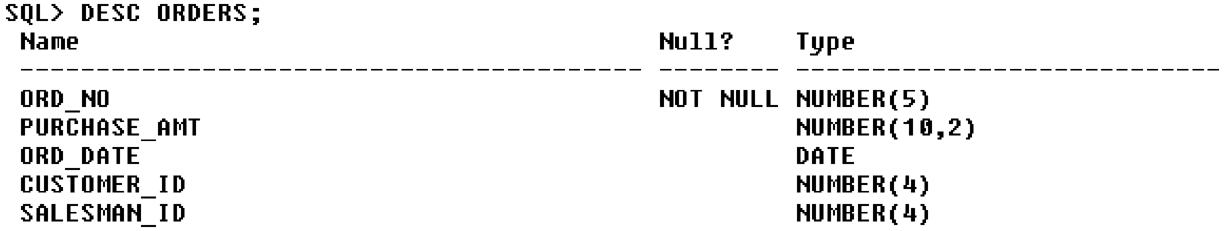
```
SQL> DESC SALESMAN;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 SALESMAN_ID                               NOT NULL NUMBER(4)
 NAME                                               VARCHAR2(15)
 CITY      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

DESC CUSTOMER1;



```
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)
```

DESC ORDERS;



```
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)
```

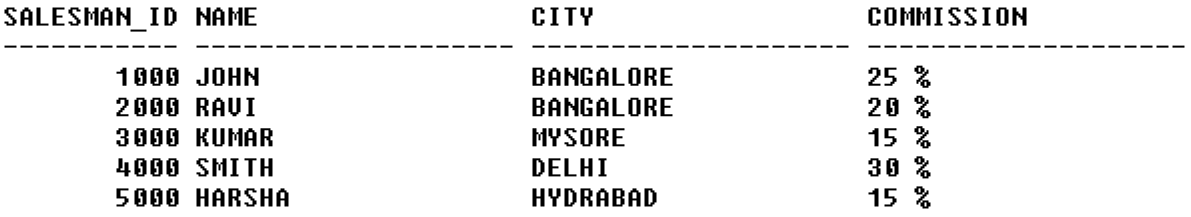
Insertion of Values to Tables

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);

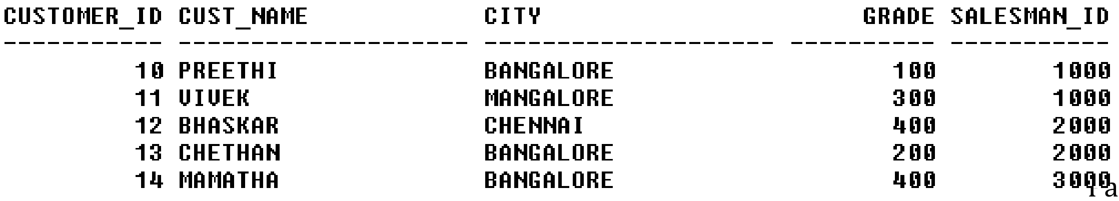
INSERT INTO ORDERS VALUES (50, 5000, ‘04-MAY-17’, 10, 1000);
INSERT INTO ORDERS VALUES (51, 450, ‘20-JAN-17’, 10, 2000);
INSERT INTO ORDERS VALUES (52, 1000, ‘24-FEB-17’, 13, 2000);
INSERT INTO ORDERS VALUES (53, 3500, ‘13-APR-17’, 14, 3000);
INSERT INTO ORDERS VALUES (54, 550, ‘09-MAR-17’, 12, 2000);

SELECT * FROM SALESMAN;



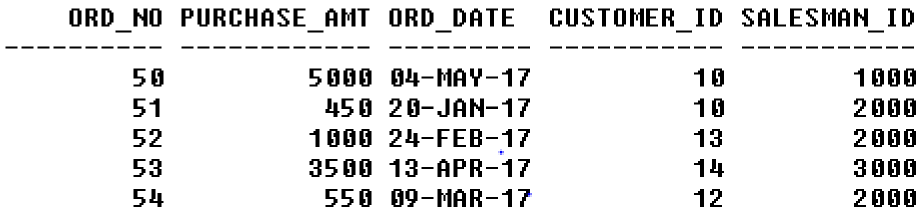
```
SALESMAN_ID NAME                 CITY                 COMMISSION
----------- -------------------- -------------------- --------------------
       1000 JOHN                 BANGALORE            25 %
       2000 RAVI                 BANGALORE            20 %
       3000 KUMAR                MYSORE               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
```

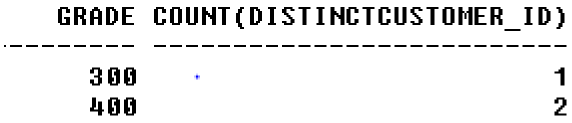
SELECT * FROM ORDERS;



```
    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:

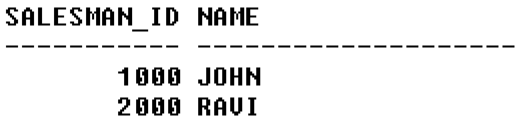
1. **Count the customers with grades above Bangalore's average.**
   SELECT GRADE, COUNT (DISTINCT CUSTOMER_ID)
   FROM CUSTOMER1
   GROUP BY GRADE
   HAVING GRADE > (SELECT AVG(GRADE)
   FROM CUSTOMER1
   WHERE CITY='BANGALORE');



```
     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);

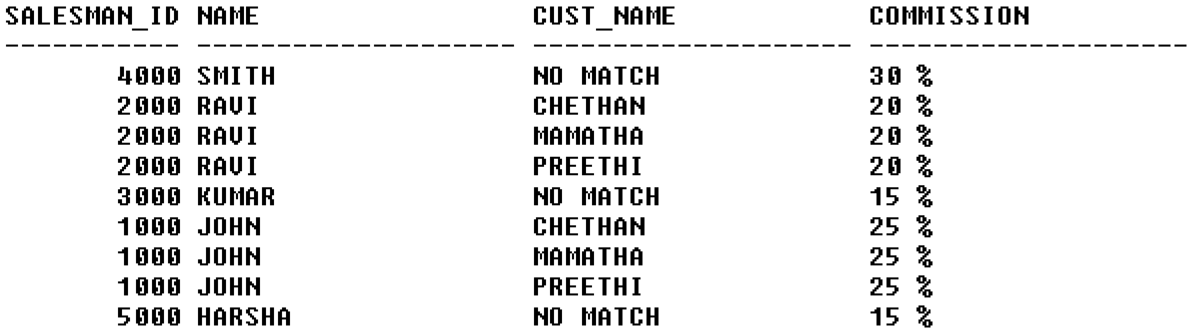


```
SALESMAN_ID NAME
----------- --------------------
       1000 JOHN
       2000 RAVI
```

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

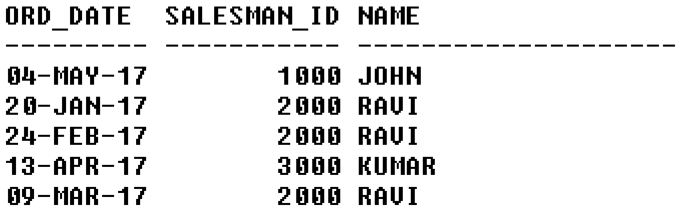
```
SELECT SALESMAN_ID, NAME, 'NO MATCH', COMMISSION
FROM SALESMAN
WHERE NOT CITY = ANY
 (SELECT CITY FROM
 CUSTOMER1) ORDER BY 2
 DESC;
```



```
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);
```



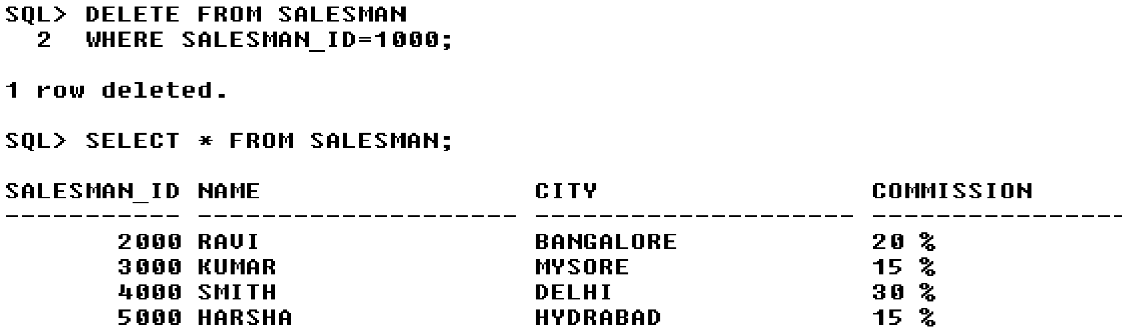
```
ORD_DATE  SALESMAN_ID NAME
--------- ----------- --------------------
04-MAY-17        1000 JOHN
20-JAN-17        2000 RAVI
24-FEB-17        2000 RAVI
13-APR-17        3000 KUMAR
09-MAR-17        2000 RAVI
```

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 %
```

EXPERIMENT 3

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

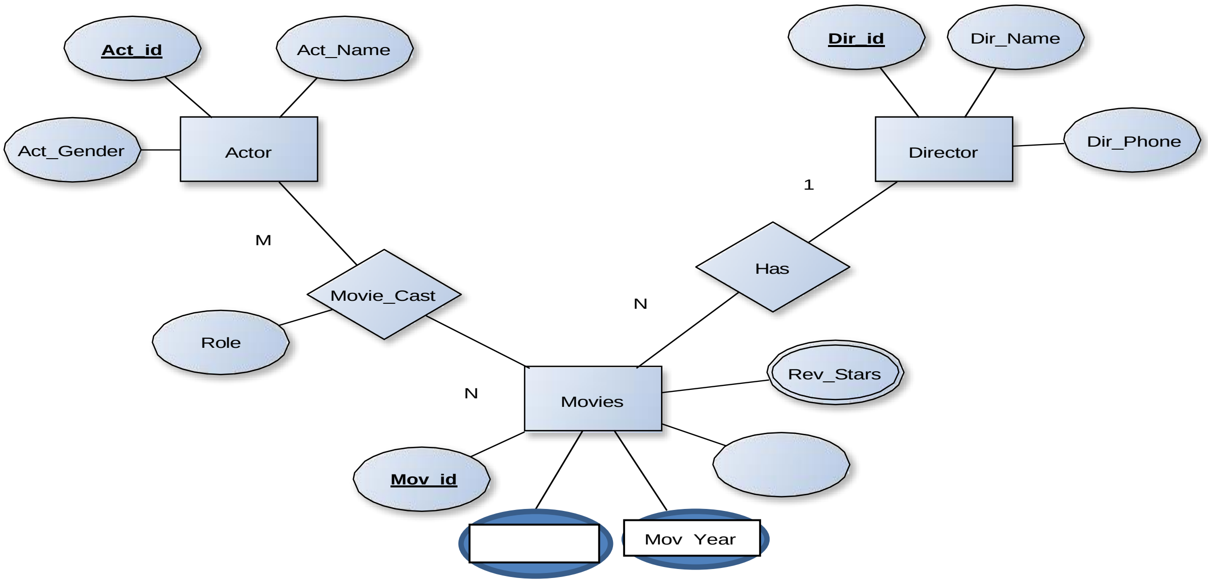
ACTOR (*Act_id*, *Act_Name, Act_Gender*)
DIRECTOR (*Dir_id*, *Dir_Name, Dir_Phone*)
MOVIES (*Mov_id*, *Mov_Title, Mov_Year, Mov_Lang, Dir_id*)
MOVIE_CAST (*Act_id*, *Mov_id*, *Role*)
RATING (*Mov_id*, *Rev_Stars*)

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



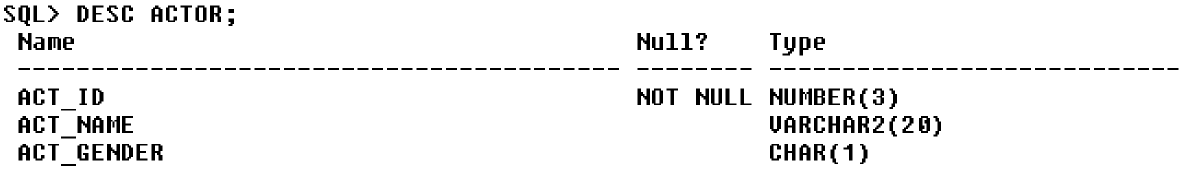
Schema Diagram

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));
```

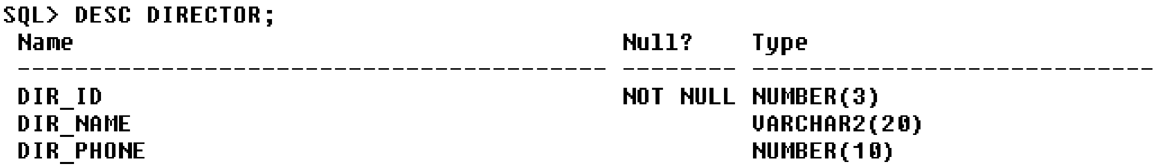
Table Descriptions

DESC ACTOR;



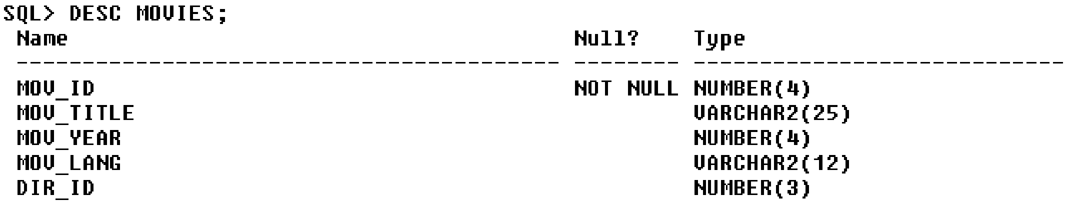
```
SQL> DESC ACTOR;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 ACT_ID                                    NOT NULL NUMBER(3)
 ACT_NAME                                           VARCHAR2(20)
 ACT_GENDER   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

DESC DIRECTOR;



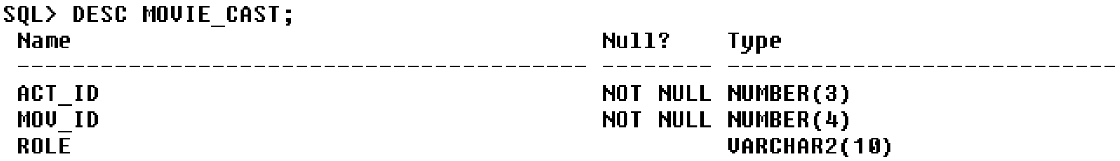
```
SQL> DESC DIRECTOR;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DIR_ID                                    NOT NULL NUMBER(3)
 DIR_NAME                                           VARCHAR2(20)
 DIR_PHONE 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

DESC MOVIES;



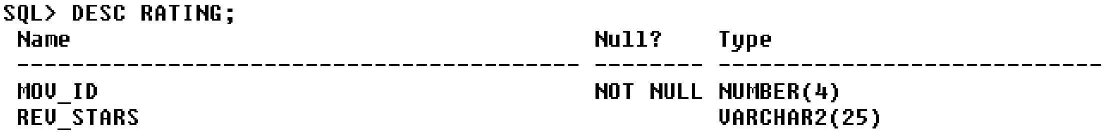
```
SQL> DESC MOVIES;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 MOV_ID                                    NOT NULL NUMBER(4)
 MOV_TITLE                                          VARCHAR2(25)
 MOV_YEAR    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

DESC MOVIE_CAST;



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

DESC RATING;



```
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’);
```

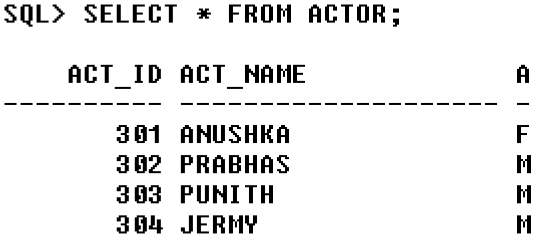
```
INSERT INTO DIRECTOR VALUES (60,’RAJAMOULI’, 8751611001);
INSERT INTO DIRECTOR VALUES (61,’HITCHCOCK’, 7766138911);
INSERT INTO DIRECTOR VALUES (62,’FARAN’, 9986776531);
INSERT INTO DIRECTOR VALUES (63,’STEVEN SPIELBERG’, 8989776530);
```

```
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’);
```

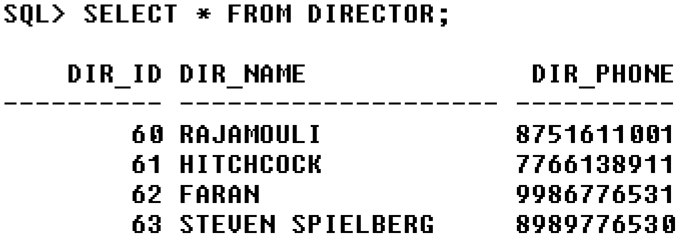
```
INSERT INTO RATING VALUES (1001, 4);
INSERT INTO RATING VALUES (1002, 2);
INSERT INTO RATING VALUES (1003, 5);
INSERT INTO RATING VALUES (1004, 4);
```

```
SELECT * FROM ACTOR;
```



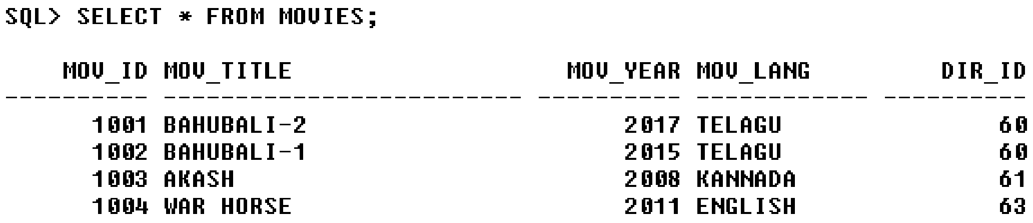
```
SQL> SELECT * FROM ACTOR;

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

```
SELECT * FROM DIRECTOR;
```



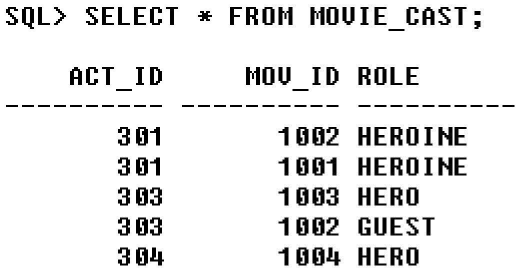
```
SQL> SELECT * FROM DIRECTOR;

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

SELECT * FROM MOVIES;



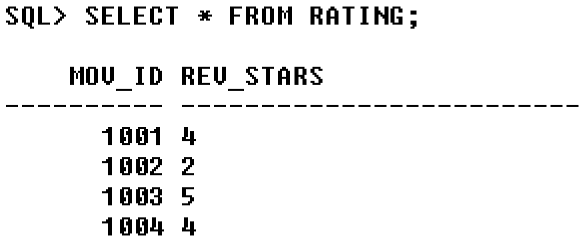
```
SQL> SELECT * FROM MOVIES;

    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
```

SELECT * FROM MOVIE_CAST;



```
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
```

SELECT * FROM RATING;

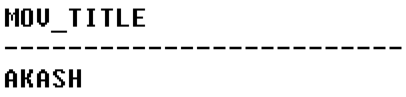


```
SQL> SELECT * FROM RATING;

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

Queries:

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

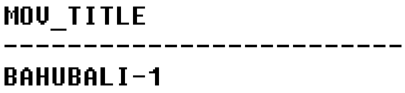
```
SELECT MOV_TITLE
FROM MOVIES
WHERE DIR_ID IN (SELECT DIR_ID
                 FROM DIRECTOR
                 WHERE DIR_NAME = 'HITCHCOCK');
```



```
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;
```



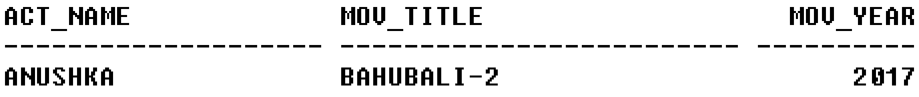
```
MOV_TITLE
-------------------------
BAHUBALI-1
```

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

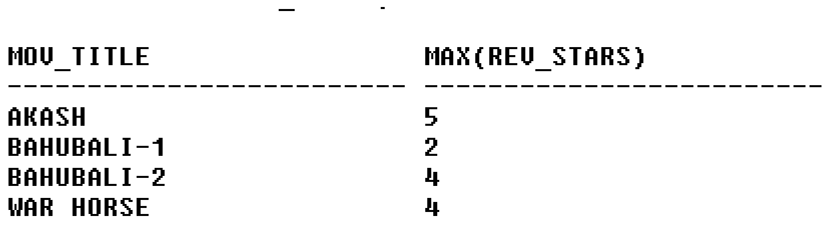
```
SELECT A.ACT_NAME, A.ACT_NAME, C.MOV_TITLE, C.MOV_YEAR
FROM ACTOR A, MOVIE_CAST B, MOVIES C
WHERE A.ACT_ID=B.ACT_ID
AND B.MOV_ID=C.MOV_ID
AND C.MOV_YEAR NOT BETWEEN 2000 AND 2015;
```



```
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.**

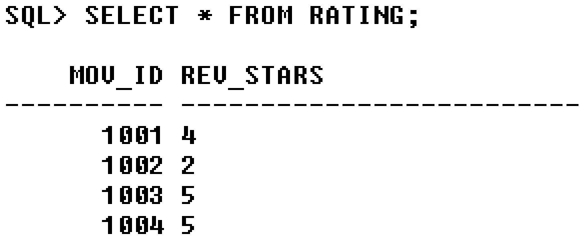
```
SELECT MOV_TITLE, MAX (REV_STARS)
FROM MOVIES
INNER JOIN RATING USING (MOV_ID)
GROUP BY MOV_TITLE
HAVING MAX (REV_STARS)>0
ORDER BY MOV_TITLE;
```



```
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
```

EXPERIMENT 4

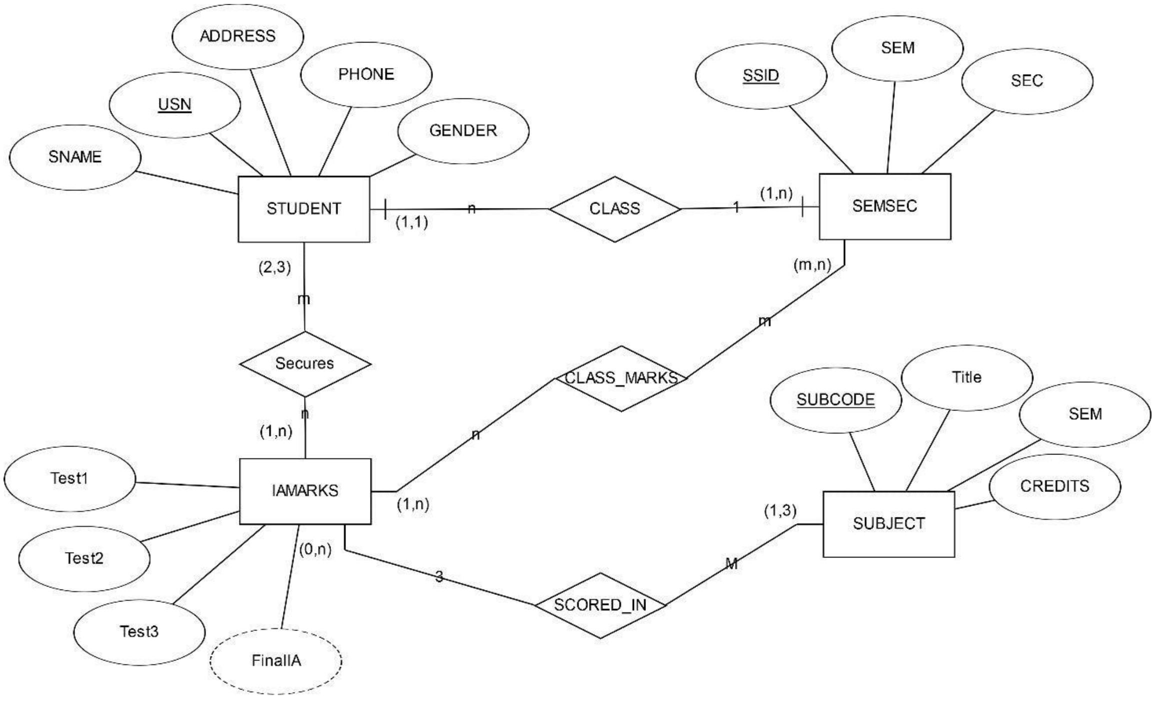
4. Consider the schema for College Database:

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 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.

Solution:

Entity - Relationship Diagram



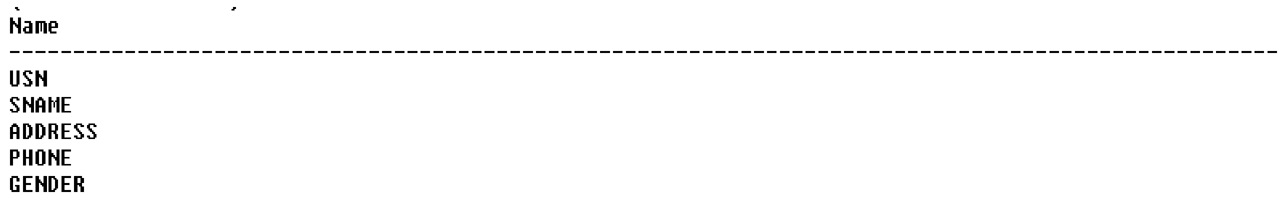
Schema Diagram

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));
```

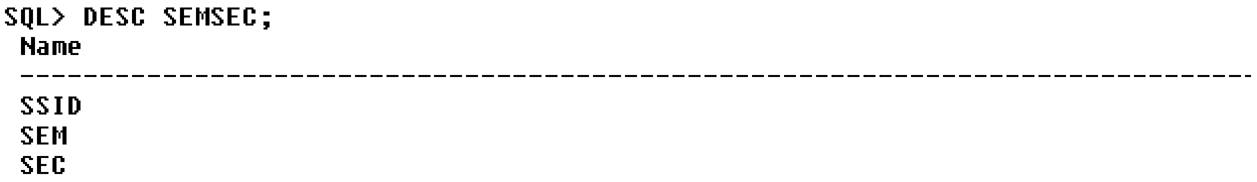
Table Descriptions

DESC STUDENT;



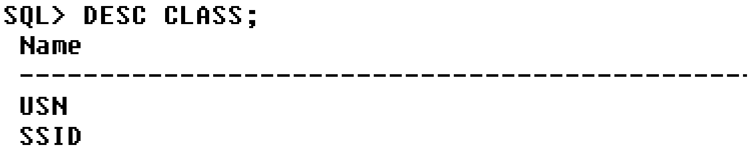
```
Name
------------------------------------------------------------------------------------------------
USN
SNAME
ADDRESS
PHONE
GENDER
```

DESC SEMSEC;



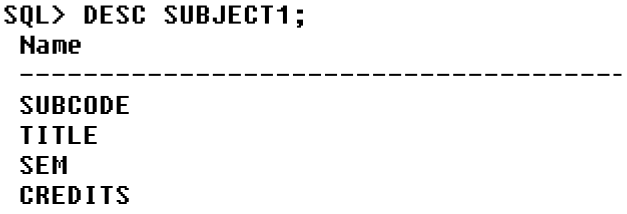
```
SQL> DESC SEMSEC;
 Name
 ---------------------------------------------------------------------------------
 SSID
 SEM
 SEC
```

DESC CLASS;



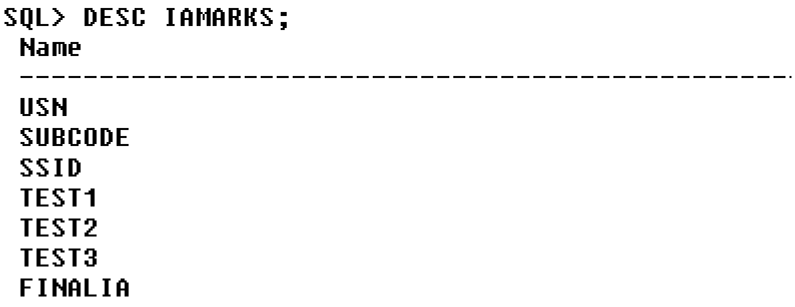
```
SQL> DESC CLASS;
 Name
 ------------------------------------------------
 USN
 SSID
```

DESC SUBJECT;



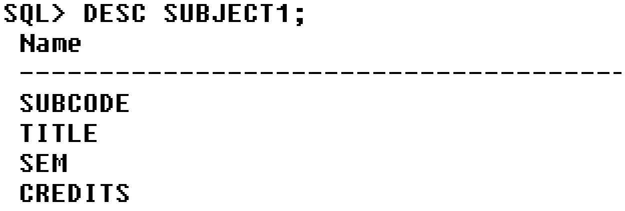
```
SQL> DESC SUBJECT1;
 Name
 ----------------------------------------
 SUBCODE
 TITLE
 SEM
 CREDITS
```

DESC IAMARKS;



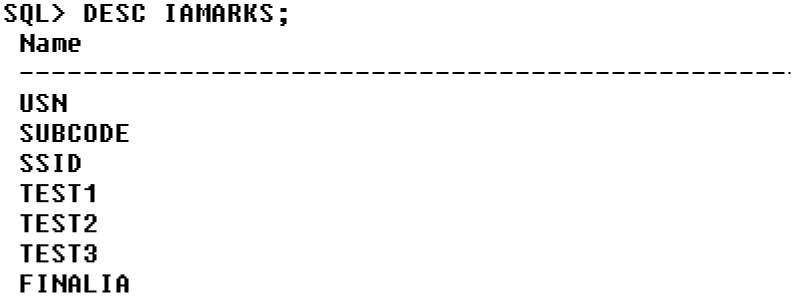
```
SQL> DESC IAMARKS;
 Name
 ---------------------------------------------------
 USN
 SUBCODE
 SSID
 TEST1
 TEST2
 TEST3
 FINALIA
```

DESC SUBJECT;



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

DESC IAMARKS;



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

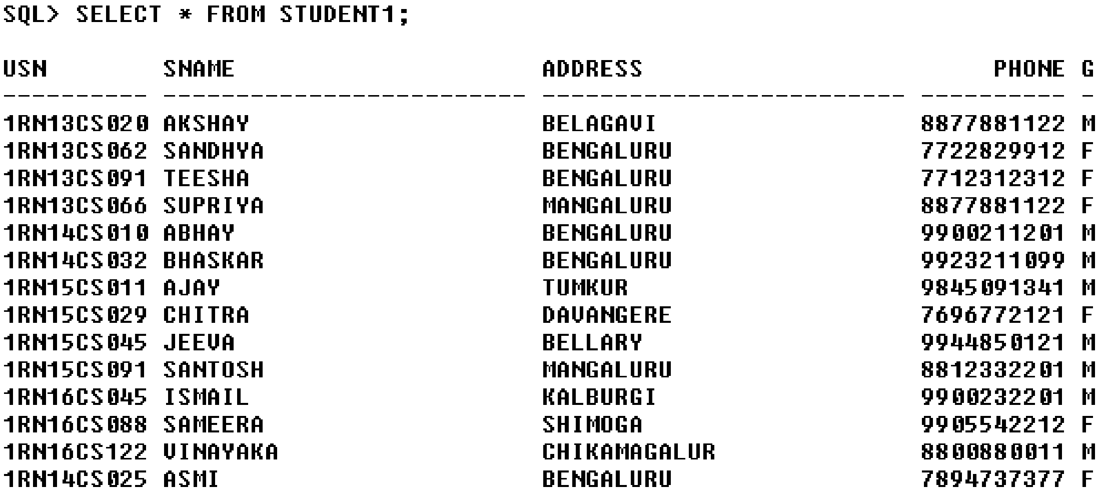
Insertion of values to tables

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 STUDENT VALUES ('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 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);
```

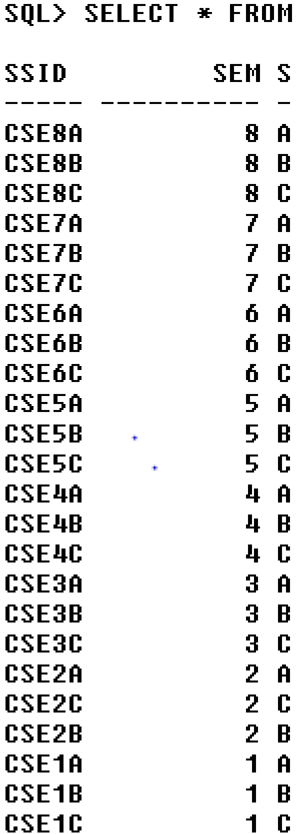
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3) VALUES ('1RN13CS091','10CS81','CSE8C', 15, 16, 18);
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3) VALUES ('1RN13CS091','10CS82','CSE8C', 12, 19, 14);
INSERT INTO IAMARKS (USN, SUBCODE, SSID, TEST1, TEST2, TEST3) VALUES ('1RN13CS091','10CS83','CSE8C',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

SELECT * FROM STUDENT;



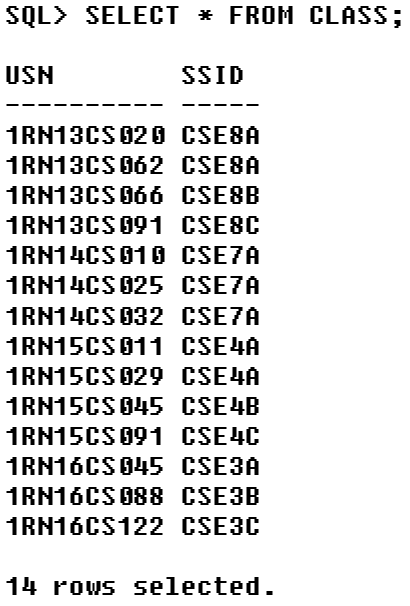
```
SQL> SELECT * FROM STUDENT1;

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
```

SELECT * FROM SEMSEC;



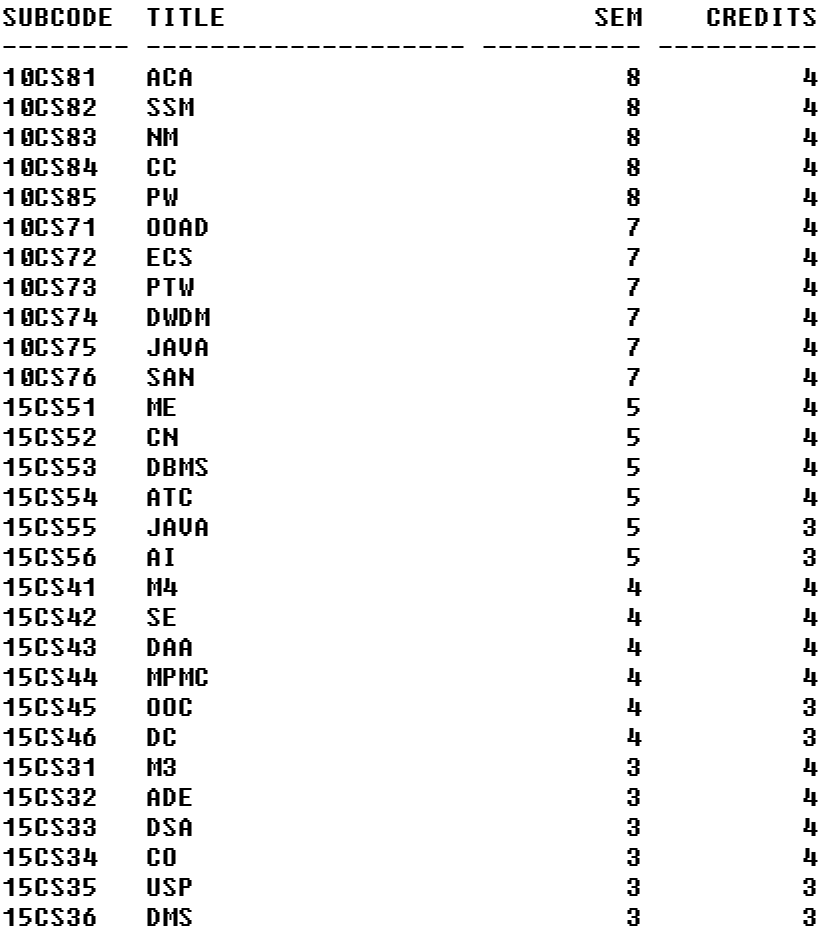
```
SQL> SELECT * FROM SEMSEC;

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
```

SELECT * FROM CLASS;



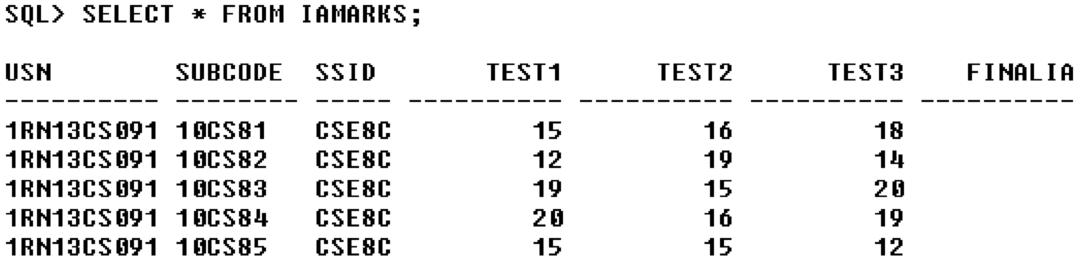
```
SQL> SELECT * FROM CLASS;

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.
```

SELECT * FROM SUBJECT;



```
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
```

SELECT * FROM IAMARKS;

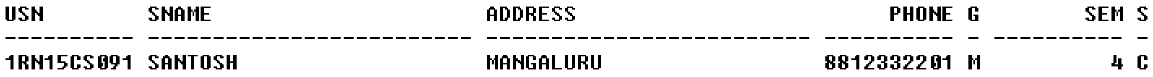


```
SQL> SELECT * FROM IAMARKS;

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
```

<u>Queries:</u>

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

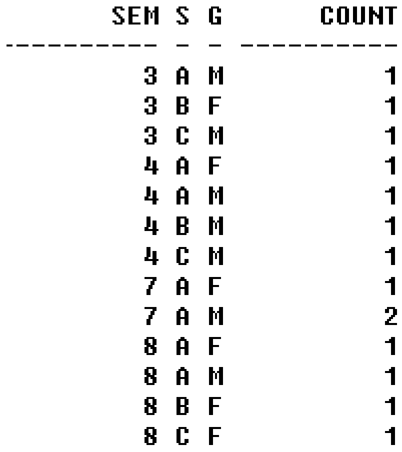
SELECT S.*, SS.SEM, SS.SEC
FROM STUDENT S, SEMSEC SS, CLASS C
WHERE S.USN = C.USN
AND SS.SSID = C.SSID
AND SS.SEM = 4
AND SS.SEc=’C’;



```
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.**

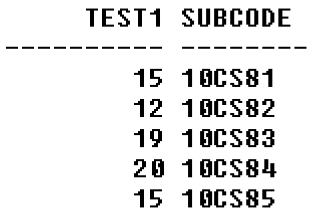
SELECT SS.SEM, SS.SEC, S.GENDER, COUNT (S.GENDER) AS COUNT
FROM STUDENT S, SEMSEC SS, CLASS C
WHERES.USN = C.USN AND
SS.SSID = C.SSID
GROUP BY SS.SEM, SS.SEC, S.GENDER
ORDER BY SEM;



```
       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 all subjects.

```
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
```

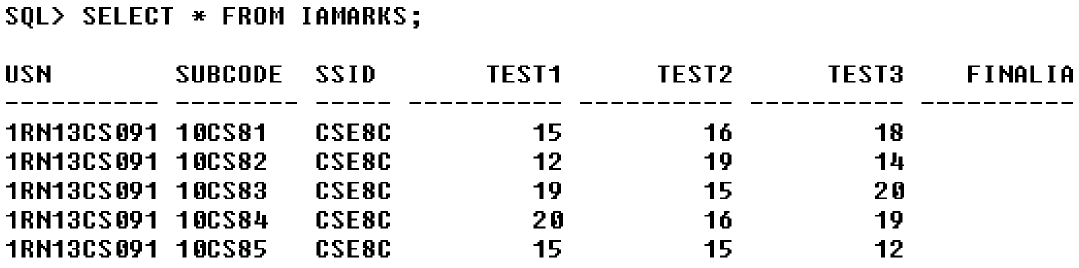
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.

```
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;
    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;

        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:

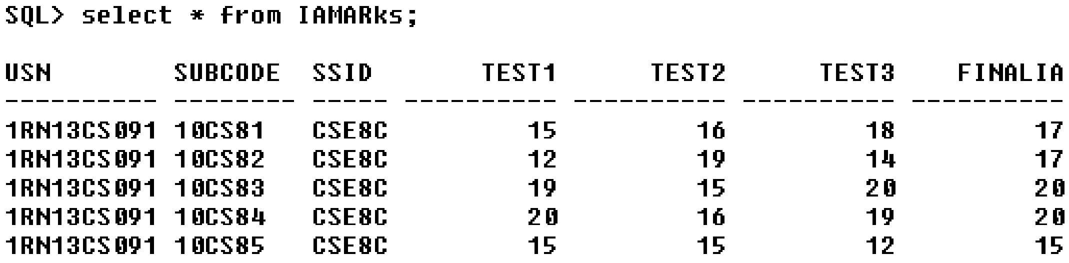
SELECT * FROM IAMARKS;



```
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;
```



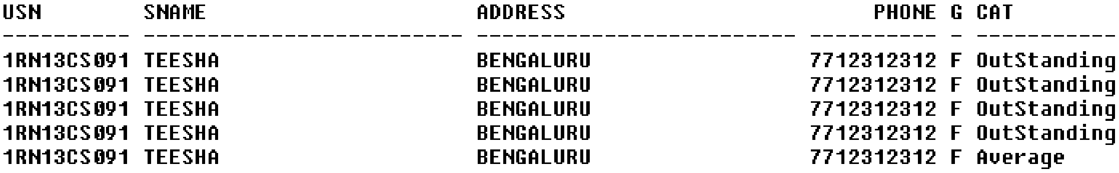
```
SQL> select * from IAMARks;

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
AND SUB.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
```

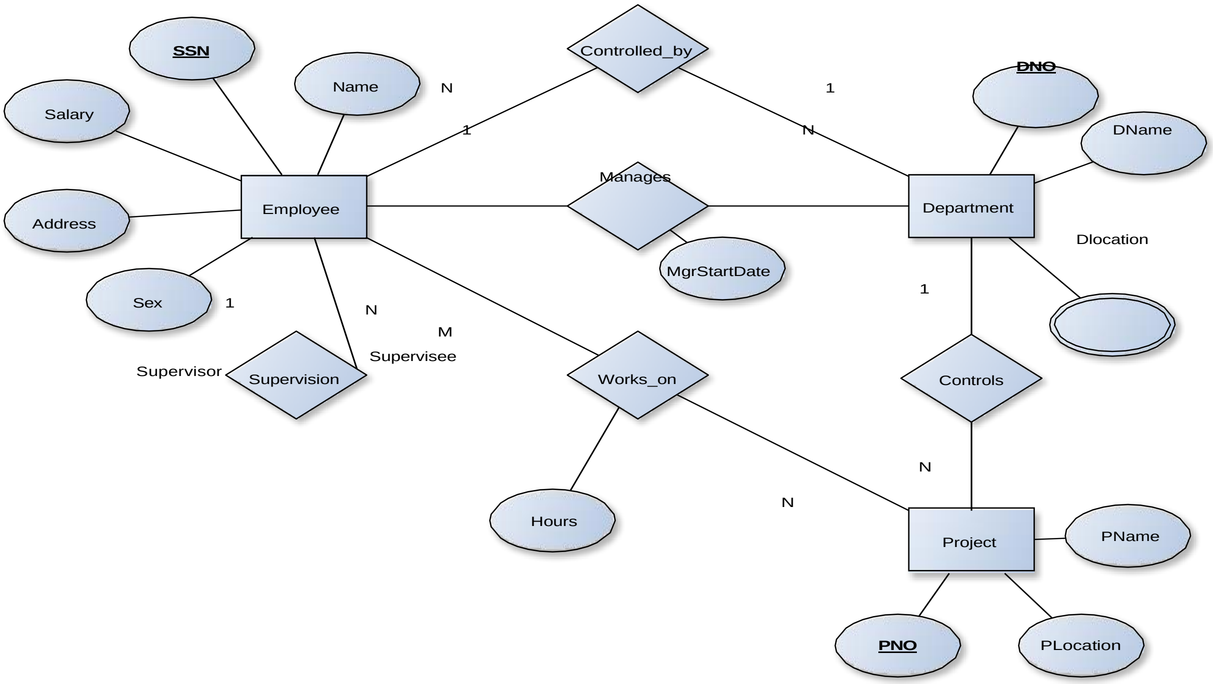
EXPERIMENT 5

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

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 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);
```

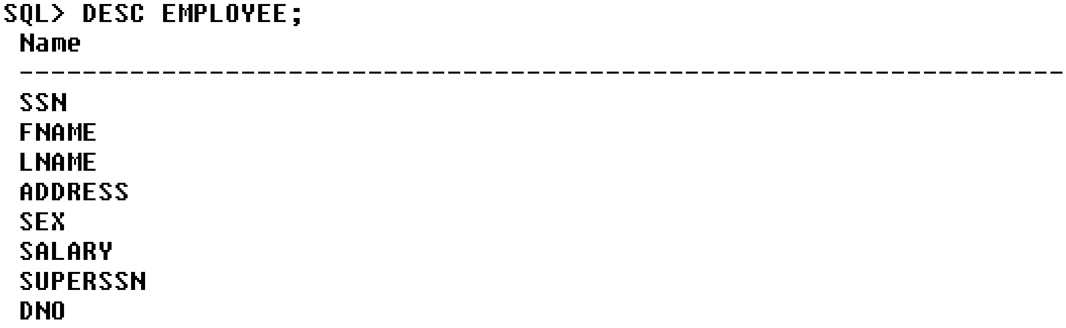
```
CREATE TABLE DLOCATION
(DLOC VARCHAR2 (20),
DNO REFERENCES DEPARTMENT (DNO),
PRIMARY KEY (DNO, DLOC));
```

```
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));
```

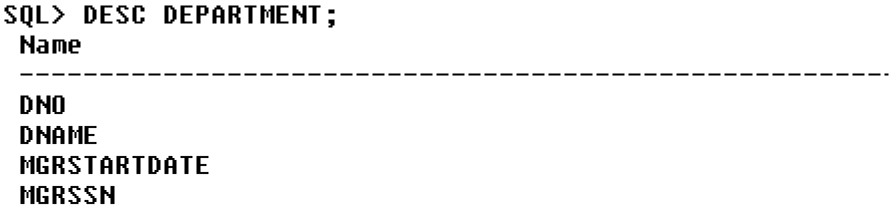
Table Descriptions

DESC EMPLOYEE;



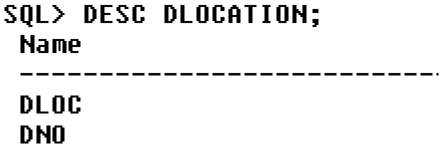
```
SQL> DESC EMPLOYEE;
 Name
 -------------------------------------------------------------------
 SSN
 FNAME
 LNAME
 ADDRESS
 SEX
 SALARY
 SUPERSSN
 DNO
```

DESC DEPARTMENT;



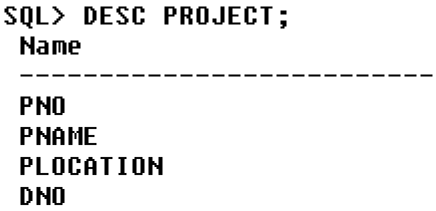
```
SQL> DESC DEPARTMENT;
 Name
 --------------------------------------------------------
 DNO
 DNAME
 MGRSTARTDATE
 MGRSSN
```

DESC DLOCATION;



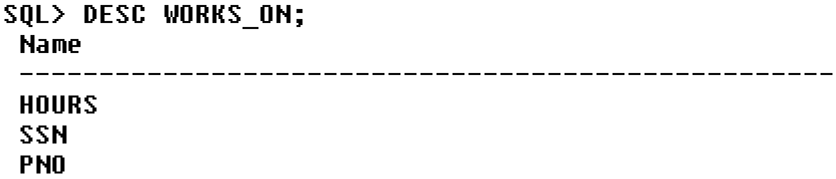
```
SQL> DESC DLOCATION;
 Name
 ---------------------------
 DLOC
 DNO
```

DESC PROJECT;



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

DESC WORKS_ON;



```
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’);
```

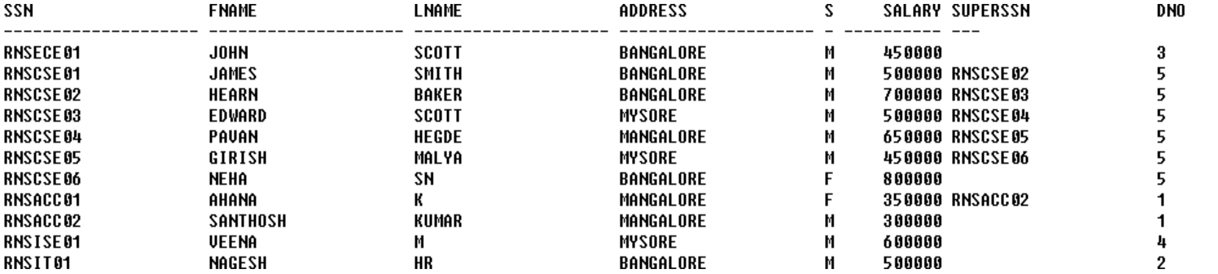
Note: update entries of employee table to fill missing fields SUPERSSN and DNO

```
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’);
```

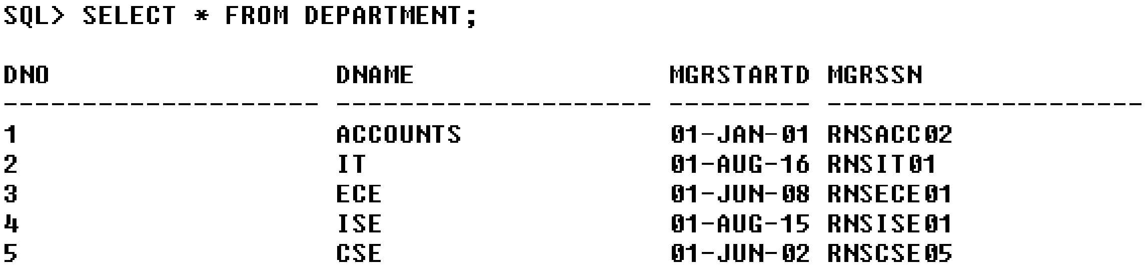
INSERT INTO PROJECT VALUES (100,’IOT’,’BANGALORE’,’5’);
INSERT INTO PROJECT VALUES (101,’CLOUD’,’BANGALORE’,’5’);
INSERT INTO PROJECT VALUES (102,’BIGDATA’,’BANGALORE’,’5’);
INSERT INTO PROJECT VALUES (103,’SENSORS’,’BANGALORE’,’3’);
INSERT INTO PROJECT VALUES (104,’BANK MANAGEMENT’,’BANGALORE’,’1’);
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;



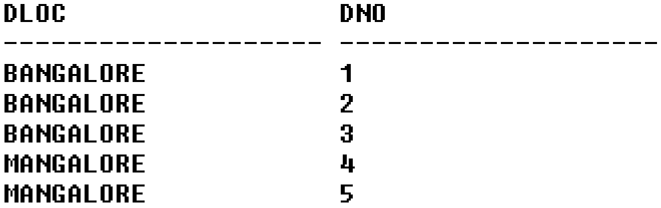
```
SSN                  FNAME                LNAME                ADDRESS              S     SALARY SUPERSSN             DNO
-------------------- -------------------- -------------------- -------------------- - ---------- ---
RNSECE01             JOHN                 SCOTT                BANGALORE            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;



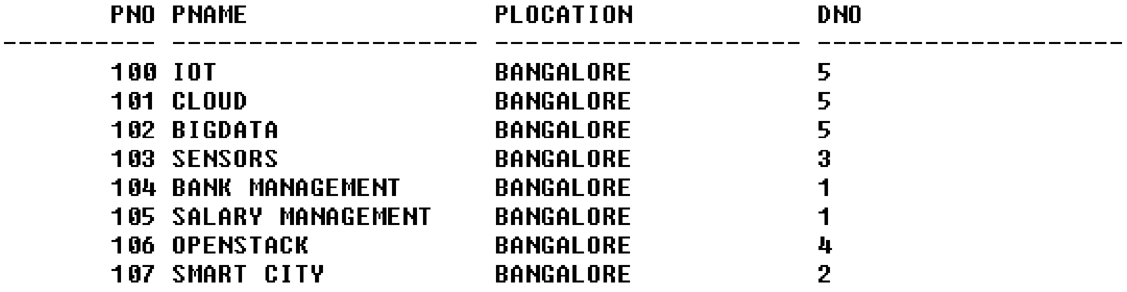
```
SQL> SELECT * FROM DEPARTMENT;

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;



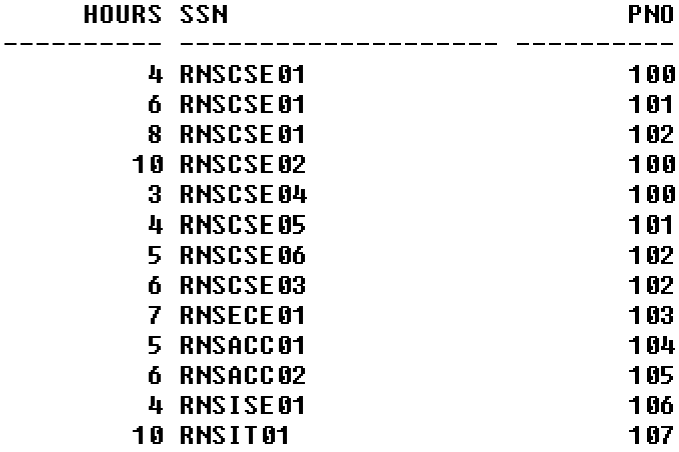
```
DLOC                 DNO
-------------------- --------------------
BANGALORE            1
BANGALORE            2
BANGALORE            3
MANGALORE            4
MANGALORE            5
```

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;

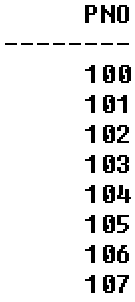


```
     HOURS SSN                         PNO
---------- -------------------- ----------
         4 RNSCSE01                    100
         6 RNSCSE01                    101
         8 RNSCSE01                    102
        10 RNSCSE02                    100
         3 RNSCSE04                    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.**

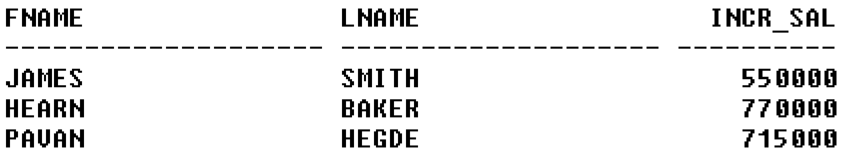
```
(SELECT DISTINCT P.PNO
FROM PROJECT P, DEPARTMENT D, EMPLOYEE E
WHERE E.DNO=D.DNO
AND D.MGRSSN=E.SSN  AND E.LNAME=’SCOTT’)
UNION
(SELECT DISTINCT P1.PNO
FROM PROJECT P1, WORKS_ON W, EMPLOYEE E1
WHERE P1.PNO=W.PNO AND E1.SSN=W.SSN
AND E1.LNAME=’SCOTT’);
```



```
       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.**

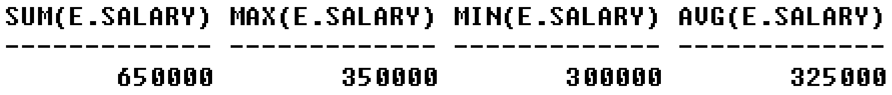
```
SELECT E.FNAME, E.LNAME, 1.1*E.SALARY AS INCR_SAL
FROM EMPLOYEE E, WORKS_ON W, PROJECT P
WHERE E.SSN=W.SSN
AND W.PNO=P.PNO
AND P.PNAME=’IOT’;
```



```
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**

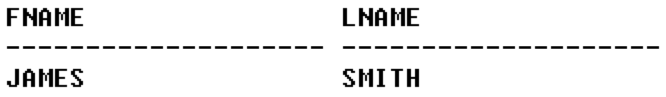
```
SELECT SUM (E.SALARY), MAX (E.SALARY), MIN (E.SALARY), AVG
(E.SALARY)
FROM EMPLOYEE E, DEPARTMENT D
WHERE E.DNO=D.DNO
AND D.DNAME=’ACCOUNTS’;
```



```
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).**

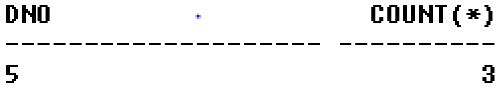
```
SELECT E.FNAME, E.LNAME
FROM EMPLOYEE E
WHERE NOT EXISTS((SELECT PNO
                  FROM PROJECT
                    WHERE DNO=’5’)
                   MINUS (SELECT PNO
                   FROM WORKS_ON
                   WHERE E.SSN=SSN));
```



```
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
```