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CHAPTER – 1

BASIC CONCEPTS OF SQL

1.1 Introduction to SQL

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

1.2 SQL Commands

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

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

security to database objects. These commands are GRANT and REVOKE.

1.2.1 Data Definition Language (DDL)

1.2.1.1 CREATE TABLE Statement

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

The Syntax for the CREATE TABLE Statement is:

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

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

SQL Data Types:

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

SQL Integrity Constraints:

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

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

1) Primary key:

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

Syntax to define a Primary key at column level:

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

Syntax to define a Primary key at table level:

```
[CONSTRAINT constraint name] PRIMARY KEY(column name1,
column_name2,..)
```

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

2) Foreign key or Referential Integrity:

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

Syntax to define a Foreign key at column level:

```
[CONSTRAINT constraint_name] REFERENCES
referenced_table_name(column_name)
```

Syntax to define a Foreign key at table level:

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

3) Not Null Constraint:

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

Syntax to define a Not Null constraint:

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

4) Unique Key:

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

Syntax to define a Unique key at column level:

```
[CONSTRAINT constraint_name] UNIQUE
```

Syntax to define a Unique key at table level:

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

5) Check Constraint:

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

Syntax to define a Check constraint:

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

1.2.1.2 ALTER TABLE Statement

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

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

Syntax to add a column

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

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

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

Syntax to drop a column

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

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

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

Syntax to modify a column

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

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

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

Syntax to add PRIMARY KEY constraint

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

Syntax to drop PRIMARY KEY constraint

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

1.2.1.3 The DROP TABLE Statement

The DROP TABLE statement is used to delete a table.

DROP TABLE table_name;

1.2.1.4 TRUNCATE TABLE Statement

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

Then, use the TRUNCATE TABLE statement:

TRUNCATE TABLE table_name;

1.2.2 Data Manipulation Language (DML):

The SELECT Statement

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

SELECT Syntax:

SELECT * FROM table_name;

The SELECT DISTINCT Statement

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

SELECT DISTINCT Syntax:

SELECT DISTINCT column_name(s) FROM table_name;

The WHERE Clause

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

WHERE Syntax:

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

The AND & OR Operators

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

The ORDER BY Clause

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

ORDER BY Syntax:

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

The GROUP BY Clause

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

GROUP BY Syntax;

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

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

The HAVING clause

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

HAVING Syntax;

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

The INSERT INTO Statement

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

SQL INSERT INTO Syntax:

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

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

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

OR

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

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

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

The UPDATE Statement

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

SQL UPDATE Syntax:

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

The DELETE Statement

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

SQL DELETE Syntax:

DELETE FROM table_name
WHERE
some_column=some_value;

1.2.3 Transaction Control language

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

Commit command

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

Following is Commit command's syntax,

commit;

Rollback command

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

Following is Rollback command's syntax

rollback to savepoint_name;

Savepoint command

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

Following is savepoint command's syntax,

savepoint savepoint_name;

1.2.4 Data Control Language

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

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

DCL defines two commands,

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

To Allow a User to create Session

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

To Allow a User to create Table

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

To provide User with some Space on Tablespace to store Table

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

To Grant all privilege to a User

```
grant sysdba to username
```

To Grant permission to Create any Table

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

1.3 STORED PROCEDURES in SQL:

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

Syntax

Following is the basic syntax of Stored procedure creation.

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

Example

Consider the CUSTOMERS table having the following records.

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

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

```
CREATE  PROCEDURE Select Customers table

data AS

SELECT * FROM Testdb.Customers

GO
```

The above command will produce the following output.

```
ID  NAME      AGE      ADDRESS          SALARY

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

1.4 SQL TRIGGERS

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

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

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

Benefits of Triggers:

Triggers can be written for the following purposes −

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

Creating Triggers

The syntax for creating a trigger is :

```
CREATE [OR REPLACE ] TRIGGER trigger_name

{BEFORE | AFTER | INSTEAD OF }

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

[OF col_name]

ON table_name

[REFERENCING OLD AS o NEW AS n]

[FOR EACH ROW]

WHEN (condition)

DECLARE

  Declaration-statements

BEGIN

  Executable-statements

EXCEPTION

  Exception-handling-statements

END;
```

Where,

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

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

Example

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

```
Select * from customers;

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

The following program creates a **row-level** trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This

trigger will display the salary difference between the old values and new values −

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

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

```
Trigger created.
```

The following points need to be considered here −

- OLD and NEW references are not available for table-level triggers, rather you can use them for record-level triggers.
- If you want to query the table in the same trigger, then you should use the AFTER keyword, because triggers can query the table or change it again only after the initial changes are applied and the table is back in a consistent state.

- The above trigger has been written in such a way that it will fire before any DELETE or INSERT or UPDATE operation on the table, but you can write your trigger on a single or multiple operations, for example BEFORE DELETE, which will fire whenever a record will be deleted using the DELETE operation on the table.

Triggering a Trigger

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

```
INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (7, 'Kriti', 22, 'HP', 7500.00 );
```

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

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

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

```
UPDATE customers
SET salary = salary + 500
WHERE id = 2;
```

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

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

1.5 VIEWS IN SQL

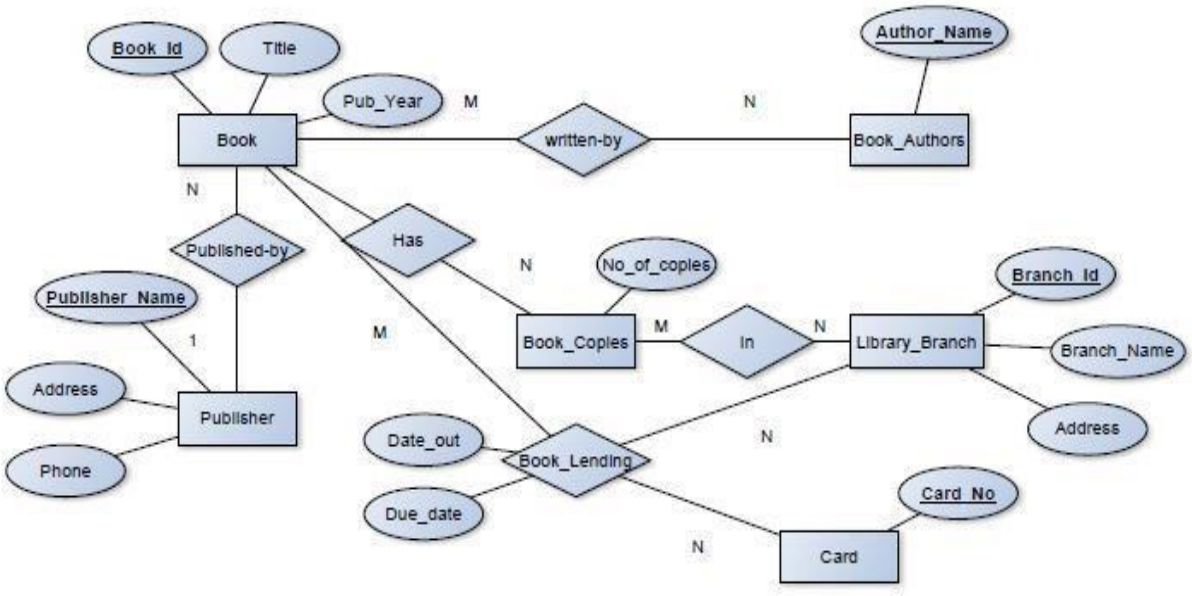
- A view is a single *virtual table* that is derived from other tables. The other tables could be base tables or previously defined view.
- Allows for limited update operations Since the table may not physically be stored
- Allows full query operations
- A convenience for expressing certain operations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

CHAPTER – 2 LIBRARY

DATABASE

1) Consider the following schema for a Library Database:
   BOOK (Book_id, Title, Publisher_Name, Pub_Year)
   BOOK_AUTHORS (Book_id, Author_Name)
   PUBLISHER (Name, Address, Phone)
   BOOK_COPIES (Book_id, 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.

ER-Diagram:



SCHEMA:

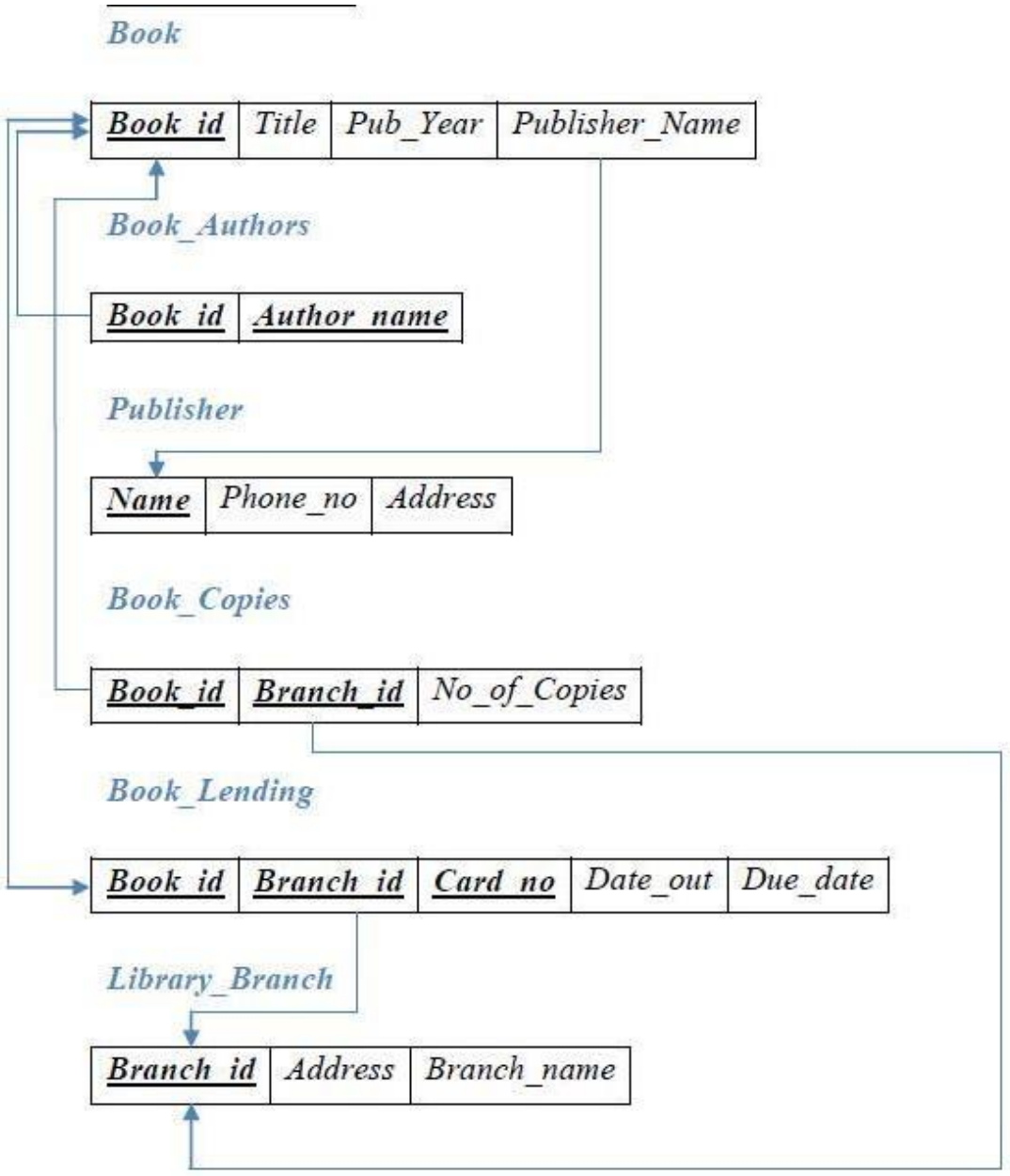

Book
Book_id
Title
Pub_Year
Publisher_Name
Book_Authors
Book_id
Author_name
Publisher
Name
Phone_no
Address
Book_Copies
Book_id
Branch_id
No_of_Copies
Book_Lending
Book_id
Branch_id
Card_no
Date_out
Due_date
Library_Branch
Branch_id
Address
Branch_name

Table Creation:

PUBLISHER

```
SQL> CREATE TABLE PUBLISHER(Pid int,
     NAME VARCHAR(18) ADDRESS
     VARCHAR(10),
     PHONE VARCHAR(10), PRIMARY KEY(pid,name));
```

Table created.

BOOK

```
SQL> CREATE TABLE BOOK(
     BOOK_ID INTEGER PRIMARY
     KEY, TITLE VARCHAR(20),
     PUBLISHER_NAME VARCHAR(20)REFERENCES PUBLISHER(NAME)ON
     DELETE CASADE,
     PUB_YEAR NUMBER(4));
```

Table created.

BOOK_AUTHORS

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

Table created.

LIBRARY_BRANCH

```
SQL> CREATE TABLE
     LIBRARY_BRANCH( BRANCH_ID
     INTEGER PRIMARY KEY,
     BRANCH_NAME VARCHAR(18),
     ADDRESS VARCHAR(15));
```

Table created.

BOOK_COPIES

```
SQL> CREATE TABLE BOOK_COPIES(
     BOOK_ID INTEGER REFERENCES BOOK(BOOK_ID) ON DELETE CASCADE,
     BRANCH_ID INTEGER REFERENCES LIBRARY_BRANCH(BRANCH_ID) ON
     DELETE CASCADE,
```

NO_OF_COPIES INTEGER,
PRIMARY KEY(BOOK_ID,BRANCH_ID));

Table created.

BOOK_LENDING

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

Table created.

Values for tables:

PUBLISHER

SQL>INSERT INTO PUBLISHER VALUES('1001','PEARSON','BANGALORE','9875462530');

SQL> INSERT INTO PUBLISHER VALUES('1002','MCGRAW','NEWDELHI','7845691234');

SQL> INSERT INTO PUBLISHER VALUES('1003','SAPNA','BANGALORE','7845963210');

BOOK

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

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

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

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

BOOK_AUTHORS

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

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

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

SQL> INSERT INTO BOOK_AUTHORS VALUES(4444,'THOMAS');

LIBRARY_BRANCH

```
SQL> INSERT INTO LIBRARY_BRANCH VALUES(11,'CENTRAL TECHNICAL','MG ROAD');

SQL> INSERT INTO LIBRARY_BRANCH VALUES(22,'MEDICAL','BH ROAD');

SQL> INSERT INTO LIBRARY_BRANCH VALUES(33,'CHILDREN','SS PURAM');

SQL> INSERT INTO LIBRARY_BRANCH VALUES(44,'SECRETARIAT','SIRAGATE');

SQL> INSERT INTO LIBRARY_BRANCH VALUES(55,'GENERAL','JAYANAGAR');
```

BOOK_COPIES

```
SQL> INSERT INTO BOOK_COPIES VALUES(1111,11,5);

SQL> INSERT INTO BOOK_COPIES VALUES(3333,22,6);

SQL> INSERT INTO BOOK_COPIES VALUES(4444,33,10);

SQL> INSERT INTO BOOK_COPIES VALUES(2222,11,12);

SQL> INSERT INTO BOOK_COPIES VALUES(4444,55,3);
```

BOOK_LENDING

```
SQL> INSERT INTO BOOK_LENDING VALUES(2222,11,1,'10-JAN-2017','20-AUG-2017');

SQL> INSERT INTO BOOK_LENDING VALUES(3333,22,2,'09-JUL-2017','12-AUG-2017');

SQL> INSERT INTO BOOK_LENDING VALUES(4444,55,1,'11-APR-2017','09-AUG-2017');

SQL> INSERT INTO BOOK_LENDING VALUES(2222,11,5,'09-AUG-2017','19-AUG-2017');

SQL> INSERT INTO BOOK_LENDING VALUES(4444,33,1,'10-JUN-2017','15-AUG-2017');

SQL> INSERT INTO BOOK_LENDING VALUES(1111,11,1,'12-MAY-2017','10-JUN-2017');

SQL> INSERT INTO BOOK_LENDING VALUES(3333,22,1,'10-JUL-2017','15-JUL-2017');
```

SQL> SELECT * FROM BOOK;

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

4 rows selected.

SQL> SELECT * FROM BOOK_AUTHORS;

BOOK_ID	AUTHOR_NAME
1111	SOMMERVILLE
2222	NAVATHE
3333	HENRY GRAY
4444	THOMAS

4 rows selected.

SQL> SELECT * FROM PUBLISHER;

Pid	NAME	ADDRESS	PHONE
1001	PEARSON	BANGALORE	9875462530
1002	MCGRAW	NEWDELHI	7845691234
1003	SAPNA	BANGALORE	7845963210

3 rows selected.

SQL> SELECT * FROM

BOOK_COPIES; BOOK_ID

BRANCH_ID	NO_OF_COPIES	
1111	11	5
3333	22	6
4444	33	10
2222	11	12
4444	55	3

5 rows selected.

SQL> SELECT * FROM BOOK_LENDING;

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

7 rows selected.

SQL> SELECT * FROM LIBRARY_BRANCH;

BRANCH_ID	BRANCH_NAME	ADDRESS
11	CENTRAL TECHNICAL	MG ROAD
22	MEDICAL	BH ROAD
33	CHILDREN	SS PURAM
44	SECRETARIAT	SIRAGATE
55	GENERAL	JAYANAGAR

5 rows selected.

Queries:

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

```
SELECT LB.BRANCH_NAME, B.BOOK_ID,TITLE,
        PUBLISHER_NAME,AUTHOR_NAME, NO_OF_COPIES
FROM BOOK B, BOOK_AUTHORS BA, BOOK_COPIES BC, LIBRARY_BRANCH
LB
WHERE B.BOOK_ID = BA.BOOK_ID
      AND BA.BOOK_ID =
      BC.BOOK_ID AND
      BC.BRANCH_ID =
      LB.BRANCH_ID
GROUP BY LB.BRANCH_NAME, B.BOOK_ID, TITLE,
         PUBLISHER_NAME, AUTHOR_NAME,
         NO_OF_COPIES;
```

BRANCH_NAME	BOOK_ID	TITLE	PUBLISHER_NAME	AUTHOR_NAME	NO_OF_COPIES
GENERAL	4444	ENCYCLOPEDIA	SAPNA	THOMAS	3
MEDICAL	3333	ANOTOMY	PEARSON	HENRY GRAY	6
CHILDREN	4444	ENCYCLOPEDIA	SAPNA	THOMAS	10
CENTRAL TECHNICAL	1111	SE	PEARSON	SOMMERVILLE	5
CENTRAL TECHNICAL	2222	DBMS	MCGRAW	NAVATHE	12

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 '30-JUN-2017'
GROUP BY CARD_NO
HAVING COUNT(*) > 3;
```

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

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 = '3333';

1 row deleted.
```

```
SQL> SELECT * FROM BOOK;

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

SQL> SELECT * FROM
  BOOK_COPIES;

BOOK_ID  BRANCH_ID  NO_OF_COPIES
1111     11         5
4444     33         10
2222     11         12
4444     55         3

SQL> SELECT * FROM BOOK_LENDING;

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

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

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

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

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

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

View created.

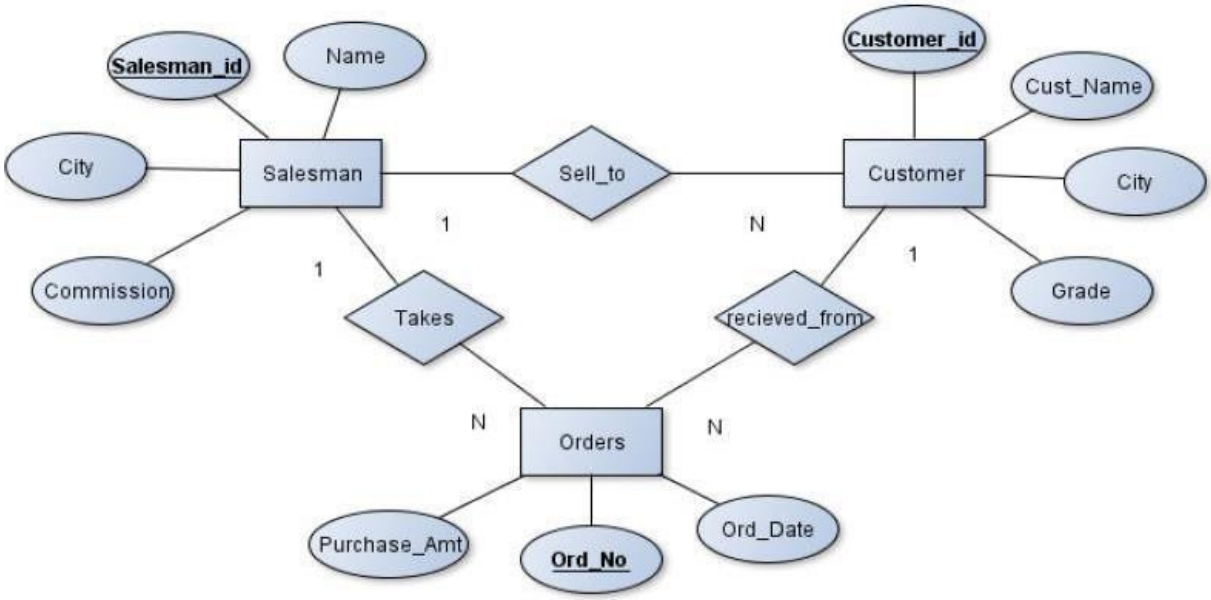
```
SQL> SELECT * FROM BOOKS_AVAILABLE;

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

CHAPTER – 3

ORDER DATABASE

2) Consider the following schema for Order
Database: SALESMAN (Salesman_id, Name, City, Commission)
CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
Write SQL queries to
   1. Count the customers with grades above Bangalore's average.
   2. Find the name and numbers of all salesmen who had more than one customer.
   3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
   4. Create a view that finds the salesman who has the customer with the highest order of a day.
   5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

ER-Diagram:



SCHEMA:

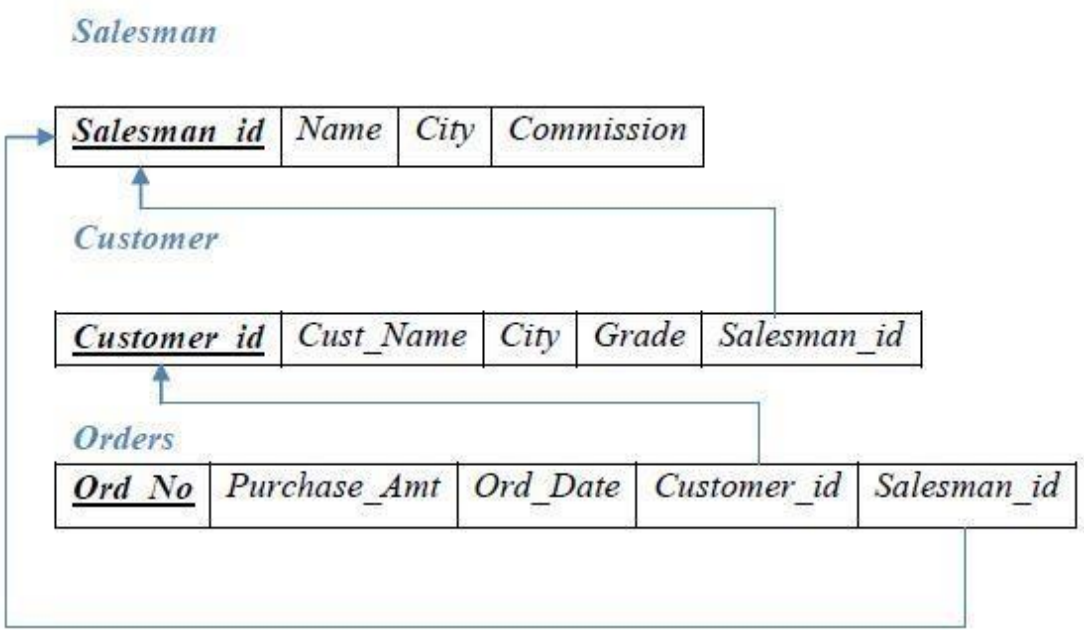


Table Creation:

SALESMAN

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

Table created.

CUSTOMER

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

Table created.

ORDERS

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

Table created.

Values for tables

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

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

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

```
SELECT * FROM SALESMAN;
```

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

```
SELECT * FROM CUSTOMER;
```

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

```
SELECT * FROM ORDERS;
```

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

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

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

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

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

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

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

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

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

```
NAME
----------
ASHWIN
BINDU
LAVAN
YA RAJ
ROHIT
```

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

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

View created.

```
SELECT * FROM

SALES_HIGHERODER;
```

SALESMAN_ID	PURCHASE_AMT
2000	300000

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

```
DELETE from salesman
WHERE salesman_id = 1000;
```

1 row deleted.

SELECT * **FROM** SALESMAN;

SALESMAN_ID	NAME	CITY	COMMISSION
2000	ASHWIN	TUMKUR	30
3000	BINDU	MUMBAI	40
4000	LAVANYA	BENGALURU	40
5000	ROHIT	MYSORE	60

SELECT * **FROM** CUSTOMER;

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

SELECT * **FROM** ORDERS;

ORD_NO	PURCHASE_AMT	ORD_DATE	CUSTOMER_ID	SALESMAN_ID
2	300000	12-APR-16	11	2000

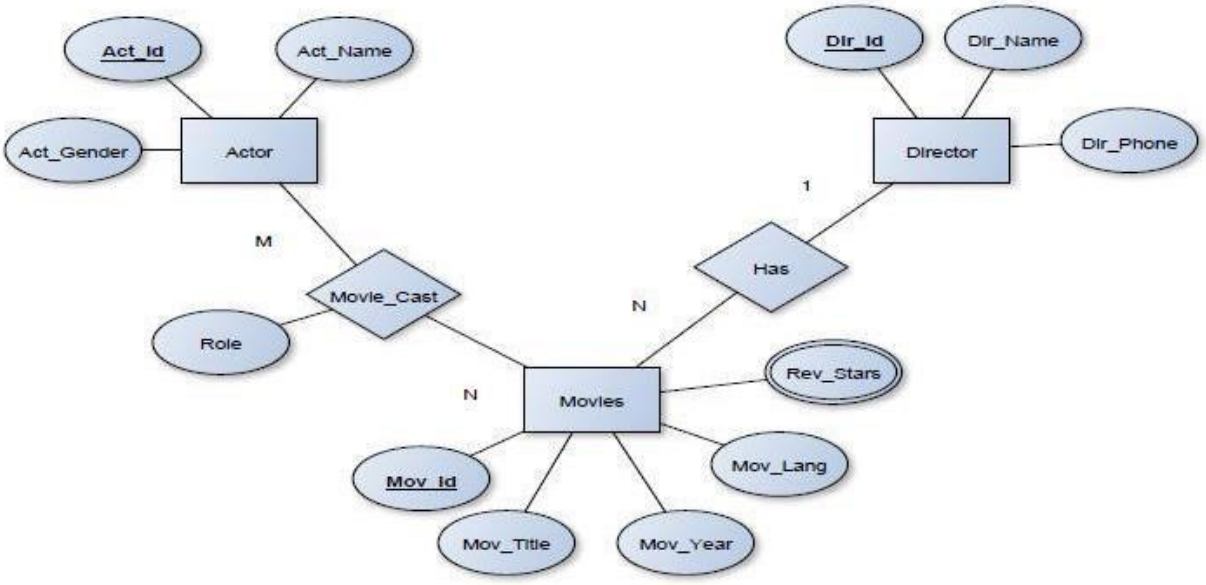
CHAPTER – 4

MOVIE DATABASE

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.

ER-Diagram:



SCHEMA:

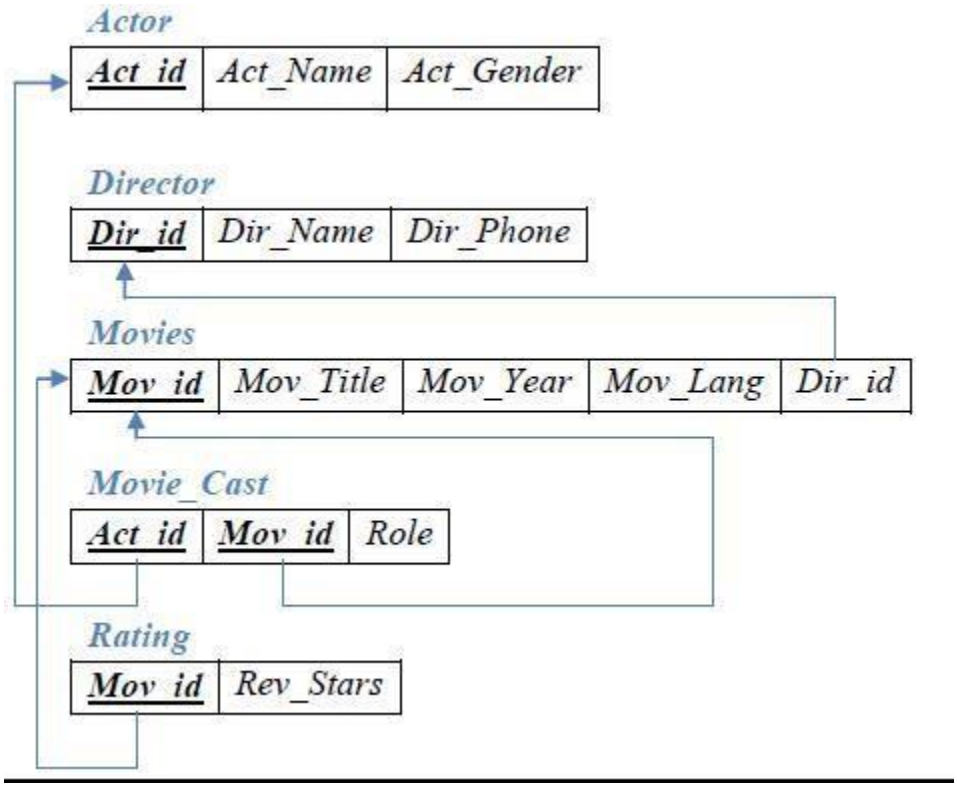


Table Creation:

ACTOR

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

Table created.

DIRECTOR

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

Table created.

MOVIES

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

Table created.

MOVIE_CAST

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

Table created.

RATING

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

Table created.

Description of Schema:

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


SQL> DESC DIRECTOR
```

```
 Name                          Null?    Type
 ----------------------------- -------- ----
 DIR_ID                        NOT NULL
 NUMBER(5)
 DIR_NAME                      NOT NULL VARCHAR2(18)
 DIR_PHONE                     NOT NULL VARCHAR(10)


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

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

Values for tables:

```
SQL> INSERT INTO ACTOR VALUES(&ACT_ID,'&ACT_NAME','&ACT_GENDER');

SQL> INSERT INTO DIRECTOR VALUES(&DIR_ID,'&DIR_NAME',&DIR_PHONE);

 SQL> INSERT INTO MOVIES
        VALUES(&MOV_ID,'&MOV_TITLE','&MOV_YEAR','&MOV_LANG',&DIR_ID);

SQL> INSERT INTO MOVIE_CAST VALUES(&ACT_ID,&MOV_ID,'&ROLE');

SQL> INSERT INTO RATING VALUES(&MOV_ID,&REV_STARS);


SQL> SELECT * FROM ACTOR;

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

SQL> SELECT * FROM DIRECTOR;

DIR_ID	DIR_NAME	DIR_PHONE
101	DWARKISH	112267809
102	RAJ MOULI	152358709
103	YOGARAJ	272337808
104	LANKESH	363445678
105	PAVAN KUMAR	385456809

SQL> SELECT * FROM MOVIES;

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

SQL> SELECT * FROM MOVIE_CAST;

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

SQL> SELECT * FROM RATING;

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

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

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

MOV_TITLE

```
----------
NOTORIO
US REAR
WINDOW
```

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

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

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

```
(SELECT
ACT_NAME
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 <
2000) INTERSECT
(SELECT
ACT_NAME
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 > 2015);

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

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

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

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

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

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

1 row updated.

```
SELECT * FROM RATING
```

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

CHAPTER - 5 AIRLINE

DATABASE

1. The following relations keep track of airline flight information:

Flights (*no:* integer, *from:* string, *to:* string, *distance:* integer, *Departs:* time, *arrives:* time, *price:* real)

Aircraft (*aid:* integer, *aname:* string, *cruisingrange:* integer)

Certified (*eid:* integer, *aid:* integer)

Employees (*eid:* integer, *ename:* string, *salary:* integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft, and only pilots are certified to fly.

Write each of the following queries in SQL.

i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.

ii. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.

iii. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.

iv. For all aircraft with *cruisingrange* over 1000 Kms, Find the name of the aircraft and the average salary of all pilots certified for this aircraft.

v. Find the names of pilots certified for some Boeing aircraft.

vi. Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

Create the above tables by properly specifying the primary keys and the foreign keys

```
Create Table flights
(
        no integer primary key,
        fromplace varchar(20) not null,
        toplace varchar(20) not null,
        distance integer not null,
         departs varchar(10)not null,
```

```
        arrives varchar(10) not null,
        price real
);

Create Table Aircraft
(
        aid int primary key,
        aname varchar(15),
        cruisingrange integer
);

Create Table employees
(
        eid int primary key,
        ename varchar(15),
        salary integer
);

Create Table certified
(
        eid int,
        aid int,
        primary key(eid,aid),
        foreign key (eid) references employees(eid),
         foreign key (aid) references aircraft(aid)
);
```

Insert the values into Relations

```
insert into flights values(255,'Bangalore','Mumbai', 200,'7:00 AM','9:00 AM',5000.00);
insert into flights values(256, 'Bangalore','Frankfurt', 400,'6:30 AM','11:30 AM',8000);
insert into flights values(257, 'Bangalore','Delhi',200,'9:30 AM','2:30 PM',5000);
insert into flights values(258,'Bangalore','Delhi',200,'10:40 AM','4:30 PM',6000);
insert into flights values(259,'Bangalore','Mangalore', 200,'11:00','7:30 PM',4000);
Select * from flights;
```

no	fromplace	toplace	distance	departs	arrives	price
255	Bangalore	Mumbai	200	7:00AM	9:00AM	5000
256	Bangalore	Frankfurt	400	6:30AM	11:30AM	8000
257	Bangalore	Delhi	200	9:30AM	2:30PM	5000
258	Bangalore	Delhi	200	10:40AM	4:30PM	6000
259	Bangalore	Mangalore	200	11:00AM	7:30PM	4000

```
insert into aircraft values(685,'Boeing15',1000);
insert into aircraft values(686,'Boeing10',2000);
insert into aircraft values(687,'Skytrain',1000);
insert into aircraft values(688,'AirBus',100);

Select * from aircraft;
```

aid	aname	cruisinrange
685	Boeing15	1000
686	Boeing10	2000
687	Skytrain	1000
688	AirBus	1500

```
insert into employees values(101,'Aruna', 90000);
insert into employees values(102,'Asha',85000);
insert into employees values(103,'Bhuvana',3000);
insert into employees values(104,'Radha',4000);
```

Select * from employees;

eid	ename	salary
101	Aruna	90000
102	Asha	85000
103	Bhuvana	3000
104	Radha	4000

```
insert into certified values(101,685);
insert into certified values(101,686);
insert into certified values(101,687);
insert into certified values(101,688);
insert into certified values(102,685);
insert into certified values(103,686);
insert into certified values(103,687);
```

Select * from certified;

eid	aid
101	685
101	686
101	687
101	688
102	685
103	686
103	687

i) Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.

Select distinct a.aname from aircraft a where a.aid not in(select c.aid from certified c,employees e where c.eid=e.eid and e.salary<80000);

aname
Boeing15
AirBus

ii) For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.

Select c.eid,max(a.cruisingrange) from certified c, aircraft a where c.aid =a.aid group by c.eid having count(c.aid)>3;

eid	Max(a.cruisinrange)
101	2000

iii) Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.

Select ename from employees where salary < (select min(price) from flights where fromplace='Bangalore' and toplace='Frankfurt');

ename
Bhuvana
Radha

iv)For all aircraft with *cruisingrange* over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for this aircraft.

Select name,avgsal from(select a.aid,a.aname as name,avg(e.salary) as avgsal from aircraft a, certified c,employees e where a.aid=c.aid and c.eid=e.eid and cruisingrange>1000 group by a.aid,a.aname);

name	Avgsal
Boeing10	46500

v) Find the names of pilots certified for some Boeing aircraft.

Select distinct e.ename from employees e,certified c,aircraft a where a.aid=c.aid and c.eid =e.eid and a.aname like 'Boeing%';

ename
Asha
Bhuvana
Aruna

vi) Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

Select a.aid from aircraft a where a.cruisingrange >(select min(distance) from flights where fromplace='Bangalore' and toplace='Delhi');

aid
685
686
687

CHAPTER 6

BANKING ENTERPRISE DATABASE

5. Consider the following database for a banking enterprise
BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string,
customer-city:string)
LOAN(loan-number:int, branch-name:string, amount:real)
BORROWER(customer-name:string, loan-number:int)
Write each of the following queries in SQL.
i. Create the above tables by properly specifying the primary keys and the foreign keys
ii. Enter at least five tuples for each relation
iii. Find all the customers who have at least two accounts at the *Main* branch.
iv. Find all the customers who have an account at *all* the branches located in a specific city.
v. Demonstrate how you delete all account tuples at every branch located in a specific city.
vi. Find the names of all depositors of a specific branch.
vii. Find the details of all loan holder of a specific branch.

Create:

```
CREATE TABLE branch
 ( branch_name VARCHAR(15),
   branch_city VARCHAR(15),
   assets NUMBER(10,2),
   PRIMARY KEY(branch_name)
 );

 CREATE TABLE account
 ( accno INTEGER(8),
   branch_name VARCHAR(15),
   balance NUMBER(10,2),
   PRIMARY KEY(accno),
   FOREIGN KEY(branch_name) REFERENCES branch(branch_name)ON DELETE
CASCADE   );

CREATE TABLE customer
( customer_name VARCHAR(15),
  customer_street VARCHAR(15),
  customer_city VARCHAR(15),
  PRIMARY KEY(customer_name)
);

CREATE TABLE loan
( loan_number INTEGER(8),
  branc_hname VARCHAR(15),
  amount NUMBER(10,2),
  PRIMARY KEY(loan_number),
  FOREIGN KEY(branch_name) REFERENCES branch(branch_name) );
```

```
CREATE TABLE depositor
( customer_name VARCHAR(15),
  accno INTEGER,
  PRIMARY KEY(customer_name, accno),
  FOREIGN KEY(customer_name) REFERENCES customer(customer_name),
  FOREIGN KEY(accno) REFERENCES account(accno)
);

CREATE TABLE borrower
( customer_name  VARCHAR(15),
  loan_number INTEGER(8),
  PRIMARY KEY(customer_name, loan_number),
  FOREIGN KEY(customer_name) REFERENCES customer(customer_name),
  FOREIGN KEY(loan_number) REFERENCES loan(loan_number)
);
```

INSERTIONS:

```
insert into branch (branch_name,branch_city,assets) values
        ("b1","c1",10000),
        ("b2","c2",20000),
        ("b3","c3",30000),
        ("b4","c4",40000),
        ("b5","c5",50000);
Query OK, 5 rows affected (0.06 sec)
Records: 5  Duplicates: 0  Warnings:0
mysql> SELECT * FROM branch;

+-------------+-------------+--------+
| branch_name | branch_city | assets |
+-------------+-------------+--------+
| b1          | c1          |  10000 |
| b2          | c2          |  20000 |
| b3          | c3          |  30000 |
| b4          | c4          |  40000 |
| b5          | c5          |  50000 |
+-------------+-------------+--------+
5 rows in set (0.00 sec)
INSERT INTO account (accno,branch_name,balance) VALUES
        (12,"b1",3000),
        (22,"b2",4000),
        (32,"b3",5000),
        (42,"b4",6000),
         (52,"b5",7000);

Query OK, 5 rows affected (0.06 sec)
Records: 5  Duplicates: 0  Warnings: 0
mysql> SELECT * FROM account;
```

```
+-------+------------+---------+
| accno | branch_name | balance |
+-------+------------+---------+
|    12 | b1         |    3000 |
|    22 | b2         |    4000 |
|    32 | b3         |    5000 |
|    42 | b4         |    6000 |
|    52 | b5         |    7000 |
+-------+------------+---------+
5 rows in set (0.00 sec)
 INSERT INTO customer (customer_name,customer_street,customer_city) VALUES
         ("cust1","cstreet1","ccity1"),
        ("cust2","cstreet2","ccity2"),
        ("cust3","cstreet3","ccity3"),
        ("cust4","cstreet4","ccity4"),
        ("cust5","cstreet5","ccity5");

Query OK, 5 rows affected (0.07 sec)
Records: 5  Duplicates: 0  Warnings: 0
SELECT * FROM customer;
+--------------+----------------+--------------+
| customer_name | customer_street | customer_city |
+--------------+----------------+--------------+
| cust1        | cstreet1       | ccity1       |
| cust2        | cstreet2       | ccity2       |
| cust3        | cstreet3       | ccity3       |
| cust4        | cstreet4       | ccity4       |
| cust5        | cstreet5       | ccity5       |
+--------------+----------------+--------------+
5 rows in set (0.00 sec)
 INSERT INTO depositor (customer_name,accno) VALUES
       ("cust1",12),
        ("cust2",22),
        ("cust3",32),
        ("cust4",42),
         ("cust5",52);

Query OK, 5 rows affected (0.06 sec)
Records: 5  Duplicates: 0  Warnings: 0
 SELECT * FROM depositor;

+--------------+-------+
| customer_name | accno |
+--------------+-------+
| cust1        |    12 |
| cust2        |    22 |
| cust3        |    32 |
| cust4        |    42 |
| cust5        |    52 |
+--------------+-------+
5 rows in set (0.00 sec)
```

```
 INSERT INTO loan (loan_number,branch_name,amount) VALUES
    (10,"b1",10000),
    (20,"b2",20000),
    (30,"b3",30000),
    (40,"b4",40000),
    (50,"b5",50000);

Query OK, 5 rows affected (0.06 sec)
Records: 5  Duplicates: 0  Warnings: 0
 select * from loan;

+-------------+-------------+--------+
| loan_number | branch_name | amount |
+-------------+-------------+--------+
|          10 | b1          |  10000 |
|          20 | b2          |  20000 |
|          30 | b3          |  30000 |
|          40 | b4          |  40000 |
|          50 | b5          |  50000 |
+-------------+-------------+--------+
5 rows in set (0.00 sec)
 INSERT INTO borrower (customer_name,loan_number) VALUES
     ("cust1",10),
     ("cust2",20),
     ("cust3",30),
     ("cust4",40),
     ("cust5",50);

Query OK, 5 rows affected (0.05 sec)
Records: 5  Duplicates: 0  Warnings: 0
 SELECT * FROM borrower;

+---------------+-------------+
| customer_name | loan_number |
+---------------+-------------+
| cust1         |          10 |
| cust2         |          20 |
| cust3         |          30 |
| cust4         |          40 |
| cust5         |          50 |
+---------------+-------------+
5 rows in set (0.00 sec)
```

QUERIES:

iii. Find all the customers who have at least two accounts at the Main branch.

```
SELECT customer_name
        FROM depositor d,account a
        WHERE d.accno=a.accno
        AND a.branch_name='Main'
        GROUP BY d.customer_name
        HAVING COUNT(d.customer_name)>=2;
```

```
Empty set (0.00 sec)
```

updating can be done with the following commands.

```
 UPDATE account SET branch_name='Main' WHERE branch_name="b1";
 UPDATE account SET branch_name='Main' WHERE branch_name="b2";
UPDATE account SET customer_name='cust1' WHERE customer_name="cust2";

+---------------+
| customer_name |
+---------------+
| cust1         |
+---------------+
1 row in set (0.00 sec)
```

iv. Find all the customers who have an account at all the branches located in a specific city.

```
 SELECT d.customer_name
           FROM account a,branch b,depositor d
           WHERE b.branch_name=a.branch_name AND
           a.accno=d.accno AND
           b.branch_city='c3'
           GROUP BY d.customer_name
           HAVING COUNT(distinct b.branch_name)=(
             SELECT COUNT(branch_name)
             FROM branch
             WHERE branch_city='c3');

+---------------+
| customer_name |
+---------------+
| cust3         |
+---------------+
1 row in set (0.00 sec)
```

v. Demonstrate how you delete all account tuples at every branch located in a specific city.

```
DELETE FROM account WHERE branch_name IN(SELECT branch_name FROM branch
WHERE branch_city='c5');

Query OK, 1 row affected (0.04 sec)

SELECT * FROM account;


+-------+-------------+---------+
| accno | branch_name | balance |
+-------+-------------+---------+
|    12 | b1          |    3000 |
|    22 | b2          |    4000 |
|    32 | b3          |    5000 |
|    42 | b4          |    6000 |
+-------+-------------+---------+
4 rows in set (0.00 sec)
```

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VIVA QUESTIONS

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

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