DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SREE NARAYANA GURUKULAM COLLEGE OF ENGINEERING

KADAYIRUPPU, KOLENCHERY

CSL 333 DATABASE MANAGEMENT SYSTEMS LAB

SUBJECT CODE: CSL 333

SEMESTER: 5

YEAR: 3

VISION OF THE DEPARTMENT

To be a center of excellence in the discipline of Computer Science & Engineering to provide self motivated,employable individuals to society.

MISSION OF THE DEPARTMENT

M1:Human resources with Ethical values and leadership qualities

M2:Sound knowledge in Computing

M3:Research capability

M4:Contribute to society

PROGRAM OUTCOMES:

PO1 : Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO4: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select and apply appropriate techniques, resources and

modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the

engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

PROGRAM-SPECIFIC OBJECTIVES

Students of the Computer Science and Engineering program

PSO1: Shall enhance the employability skills by finding innovative solutions for challenges and problems in various domains of CS.

PSO2: Shall apply the acquired knowledge to develop software solutions and innovative mobile apps(applications) for various problems.

Course Objective :The Database Management Systems course is intended to impart the elementary concepts of a database management system to students and equip them to design and implement a database application based on those concepts. This course helps the learners to get practical exposure on database creation, SQL queries creation, transaction processing and NoSQL & MongoDB based operations. The course enables the students to create, manage and administer the databases, develop necessary tools for the design and development of the databases, and to understand emerging technologies to handle Big Data.

Course Outcomes:

CST204.1	Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)
CST204.2	Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)
CST204.3	Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
CST204.4	Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)
CST204.5	Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)
CST204.6	Develop database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)

CO PO Justification:

CO	PO	LOW/MEDIUM/HIGH	JUSTIFICATION
CST204.1	PO1	M	As students will be able to understand ER Modeling concepts
CST204.1	PO2	M	Students could identify different participation contraints and cardinality ratio in ER diagram
CST204.1	PO3	M	Students acquire competency in building E-R models of database
CST204.1	PO5	M	Students will be able to use modern tools to create ER Diagram online from relational schema and vice versa
CST204.2	PO1	M	Students will be able to classify different SQL queries
CST204.2	PO2	M	Students will be able to identify formal query languages in database
CST204.2	PO3	M	Students will be able to understand the formulation and working of SQL queries
CST204.2	PO5	M	Understanding of the working of different SQL queries is required in interacting with database
CST204.3	PO1	M	Students gain competency in PL/SQL programming.
CST204.3	PO2	M	Students acquire competency in developing PL/SQL programs
CST204.3	PO3	M	Students acquire competency in developing Trigger program from real life
CST204.3	PO4	M	Students will be able to understand working of Triggers and impact of it in a database
CST204.3	PO5	M	Students will be able to use trigger in real life database application to implement solutions
CST204.4	PO1	M	Students will be able to understand working of Functions and impact of it in a database
CST204.4	PO2	M	Students acquire competency in developing control structures using PL/SQL
CST204.4	PO3	M	Students acquire competency in developing Function program from real life
CST204.4	PO4	M	Students will be able to understand the working of function in real life applications
CST204.4	PO5	M	Students will be able to use functions in real life database application to implement solutions
CST204.5	PO1	M	Students will be able to understand various CURD commands
CST204.5	PO2	M	Students will be able to classify problems for sql and nosql applications
CST204.5	PO3	M	Students will be able to design a nosql database
CST204.5	PO5	M	Students will be able to use mongodb and interact and learn concepts of nosql
CST204.6	PO1	M	Students gain competency in designing database following normal form standards.
CST204.6	PO2	M	Students will be to apply proper normalization for developing well tuned database
CST204.6	PO3	M	Understanding of the normalization schemes for database design in developing normalized database
CST204.6	PO4	M	Students will be able to develop a new database

			application
CST204.2	PSO2	M	Students will be able to acquired knowledge to develop database applications for real life problems and innovative mobile apps(applications) for various problems

SREE NARAYANA GURUKULAM COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGG

CSL 333 DATABASE MANAGEMENT SYSTEMS LAB

10	Practice of SQL TCL commands like Rollback, Commit, Savepoint	1	CO2	PO1,PO2,PO3, PO5	48
11	Practice of SQL DCL commands for granting and revoking user privileges	1	CO2	PO1,PO2,PO3, PO5	50
12	Practice of SQL commands for creation of views and assertions	1	CO2	PO1,PO2,PO3, PO5	52
13	Implementation of various control structures like IF-THEN, IF-THEN-ELSE, IF-THEN ELSIF, CASE, WHILE using PL/SQL	2	CO4	PO1,PO2,PO3, PO4, PO5	55
14	Creation of Procedures, Triggers and Functions	2	CO3	PO1,PO2,PO3, PO4, PO5	62
15	Creation of Packages	2	CO4	PO1,PO2,PO3, PO4, PO5	68
16	Creation of Cursors	2	CO3	PO1,PO2,PO3, PO4, PO5	69
17	Creation of PL/SQL blocks for exception handling	2	CO4	PO1,PO2,PO3, PO4, PO5	71
18	Familiarization of NoSQL Databases and CRUD operations	3	CO5	PO1,PO2,PO3, PO5	72
19	Project Using Rdbms Concepts And Front End Tools	3	CO6	PO1,PO2,PO3, PO4, PO5	

INTRODUCTION TO ER MODEL

ER model is represents real world situations using concepts, which are commonly used by people. It allows defining a representation of the real world at logical level.ER model has no facilities to describe machine-related aspects.

In ER model the logical structure of data is captured by indicating the grouping of data into entities. The ER model also supports a top-down approach by which details can be given in successive stages.

Entity: An entity is something which is described in the database by storing its data, it may be a concrete entity a conceptual entity.

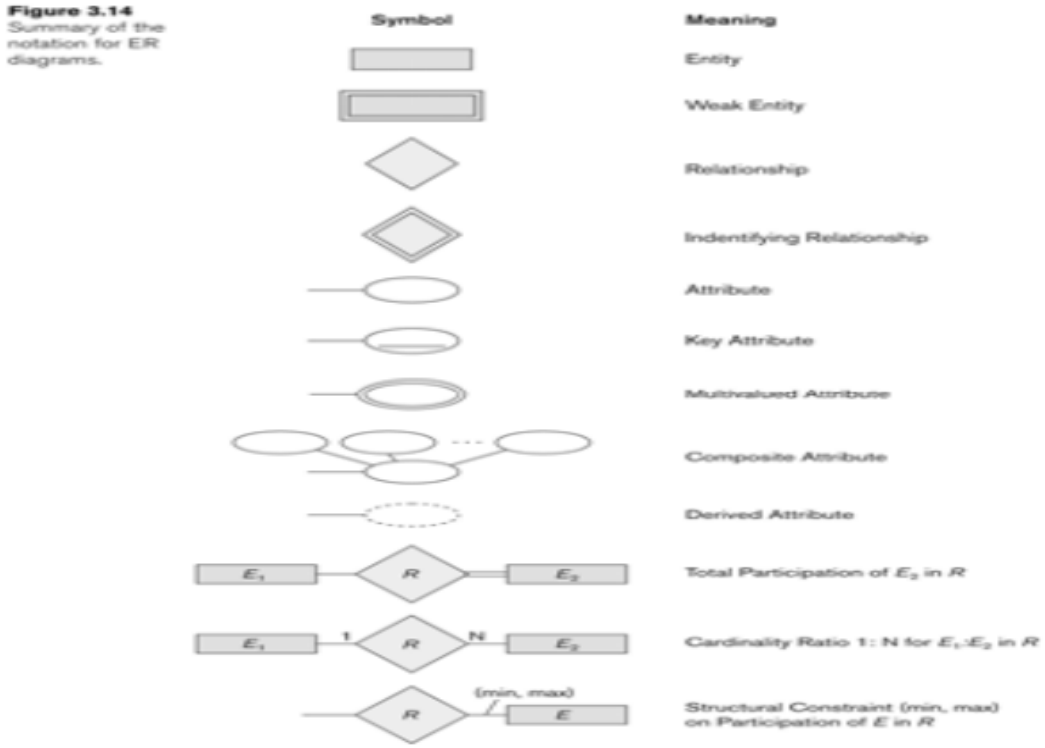
Entity set: An entity set is a collection of similar entities.

Attribute: An attribute describes a property associated with entities. Attribute will have a name and a value for each entity.

Domain: A domain defines a set of permitted values for a attribute

SYMBOLS IN E-R DIAGRAM

The ER model is represented using different symbols as shown in Fig .a



EXPERIMENT 1:

UNIVERSITY MANAGEMENT SYSTEM ER DIAGRAM

CO1 : Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)

Aim:A university registrar's office maintains data about the following entities: (a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.

Output

The main entity sets are student, course, course-offering, and instructor. The entity set course-offering is a weak entity set dependent on course. The assumptions made are :

- A class meets only at one particular place and time. This E-R diagram cannot model a class meeting at different places at different times.
- There is no guarantee that the database does not have two classes meeting at the same place and time

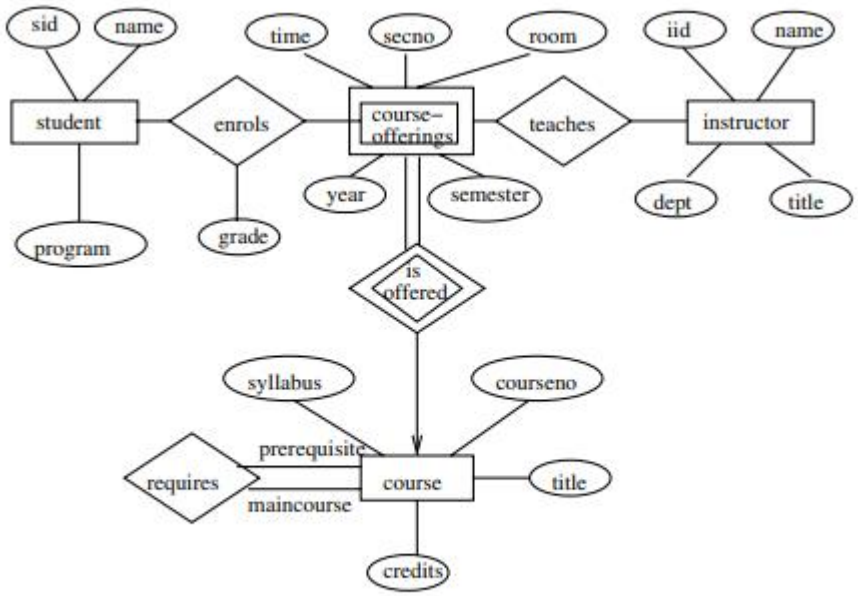


Figure 2.3 E-R diagram for a university.

RESULT

ER diagram has been drawn successfully. By constructing an ER diagram, I was able to apply standard design and modelling approach.

INTRODUCTION TO SQL

History of SQL

Dr. E. F. Codd published the paper, "A Relational Model of Data for Large Shared Data Banks", in June 1970 in the Association of Computer Machinery (ACM) journal, Communications of theACM. Codd's model is now accepted as the definitive model for relational database management systems (RDBMS). The language, Structured English Query Language ("SEQUEL") was developed by IBM Corporation, Inc., to use Codd's model. SEQUEL later became SQL (still pronounced "sequel"). In 1979, Relational Software, Inc. (now Oracle Corporation) introduced the first commercially available implementation of SQL. Today, SQL is accepted as the standard RDBMS language.

How SQL Works

The strengths of SQL provide benefits for all types of users, including application programmers, database administrators, managers, and end users. Technically speaking, SQL is a data sub-language. The purpose of SQL is to provide an interface to a relational database such as Oracle, and all SQL statements are instructions to the database. In this SQL differs from general-purpose programming languages like C and BASIC. Among the features of SQL are the following:

1. It processes sets of data as groups rather than as individual units.

2. It provides automatic navigation to the data.

3. It uses statements that are complex and powerful individually, and that therefore stand alone.

Flow-control statements were not part of SQL originally, but they are found in the recently accepted optional part of SQL, ISO/IEC 9075-5: 1996. Flow-control statements are commonly known as "persistent stored modules" (PSM), and Oracle's PL/SQL extension to SQL is similar to PSM.

Essentially, SQL lets you work with data at the logical level. You need to be concerned with the implementation details only when you want to manipulate the data. For example, to retrieve a set of rows from a table, you define a condition used to filter the rows. All rows satisfying the condition are retrieved in a single step and can be passed as a unit to the user, to another SQL statement, or to an application. You need not deal with the rows one by one, nor do you have to worry about how they are physically stored or retrieved. All SQL statements use the optimizer, a part of Oracle that determines the most efficient means of accessing the specified data. Oracle also provides techniques you can use to make the optimizer perform its job better.

SQL provides statements for a variety of tasks, including:

1. Querying data

2. Inserting, updating, and deleting rows in a table

3. Creating, replacing, altering, and dropping objects

4. Controlling access to the database and its objects

5. Guaranteeing database consistency and integrity

SQL unifies all of the above tasks in one consistent language.

Common Language for All Relational Databases

All major relational database management systems support SQL, so you can transfer all skills you have gained with SQL from one database to another. In addition, all programs written in SQL are portable. They can often be moved from one database to another with very little modification.

Summary of SQL Statements

SQL statements are divided into these categories:

1. Data Definition Language (DDL) Statements

2. Data Manipulation Language (DML) Statements

3. Transaction Control Statements (TCL)

4. Session Control Statement

5. System Control Statement

Managing Tables

A table is a data structure that holds data in a relational database. A table is composed of rows and columns. A table can represent a single entity that you want to track within your system. This type of a table could represent a list of the employees within your organization, or the orders placed for your company's products.

A table can also represent a relationship between two entities. This type of a table could portray the association between employees and their job skills, or the relationship of products to orders. Within the tables, foreign keys are used to represent relationships.

Creating Tables

To create a table, use the SQL command CREATETABLE.

Syntax:

CREATE TABLE <TABLE NAME>(<FIELD NAME ><DATA TYPE><[SIZE]>,.....)

Altering Tables

Alter a table in an Oracle database for any of the following reasons:

1. To add one or more new columns to the table

2. To add one or more integrity constraints to a table

3. To modify an existing column's definition (datatype, length, default value, and NOTNULL

4. integrity constraint)

5. To modify data block space usage parameters (PCTFREE, PCTUSED)

6. To modify transaction entry settings (INITRANS, MAXTRANS)

7. To modify storage parameters (NEXT, PCTINCREASE, etc.)

8. To enable or disable integrity constraints associated with the table

9. To drop integrity constraints associated with the table

When altering the column definitions of a table, you can only increase the length of an existing column, unless the table has no records. You can also decrease the length of a column in an empty table. For columns of data type CHAR, increasing the length of a column might be a time consuming operation that requires substantial additional storage, especially if the table contains many rows. This is because the CHAR value in each row must be blank-padded to satisfy the new column length.

If you change the datatype (for example, from VARCHAR2 to CHAR), then the data in the column does not change. However, the length of new CHAR columns might change, due to blank-padding requirements.

Altering a table has the following implications:

1. If a new column is added to a table, then the column is initially null. You can add a column with a

NOT NULL constraint to a table only if the table does not contain any rows.

2. If a view or PL/SQL program unit depends on a base table, then the alteration of the base table might affect the dependent object, and always invalidates the dependent object.

Privileges Required to Alter a Table

To alter a table, the table must be contained in your schema, or you must have either the ALTER object privilege for the table or the ALTER ANY TABLE system privilege.

Dropping Tables

Use the SQL command DROP TABLE to drop a table. For example, the following statement drops the

EMP_TAB table:

If the table that you are dropping contains any primary or unique keys referenced by foreign keys to other tables, and if you intend to drop the FOREIGN KEY constraints of the child tables, then include the CASCADE option in the DROP TABLE command.

Oracle Built-In Datatypes

A datatype associates a fixed set of properties with the values that can be used in a column of a table or in an argument of a procedure or function. These properties cause Oracle to treat values of one datatype differently from values of another datatype. For example, Oracle can add values of sNUMBER datatype, but not values of

RAW datatype.

Oracle supplies the following built-in data types:character data types

• CHAR

• NCHAR

• VARCHAR2 and VARC

• NVARCHAR2

• CLOB

• NCLOB

• LONG

1. NUMBER datatype

2. DATE datatype

3. Binary datat ypes

• BLOB

• BFILE

• RAW

• LONG RAW

Another datatype, ROWID, is used for values in the ROWIDpseudocolumn, which represents the unique address of each row in a table.

Table summarizes the information about each Oracle built-in datatype.

Summary of Oracle Built-In Data types

Using Character Data types

Use the character data types to store alphanumeric data.

1. CHAR and NCHAR data types store fixed-length character strings.

2. VARCHAR2 and NVARCHAR2 data types store variable-length character strings. (The VARCHAR dataty is synonymous with the VARCHAR2 datatype.)

3. CLOB and NCLOB data types store single-byte and multi byte character strings of up to four gigabytes.

4. The LONG datatype stores variable-length character strings containing up to two gigabytes, but with many restrictions.

5. This data type is provided for backward compatibility with existing applications; in general, new applications should use CLOB and NCLOB data types to store large amounts of character data.

When deciding which datatype to use for a column that will store alphanumeric data in a table, consider the following points of distinction:

Space Usage

1. To store data more efficiently, use the VARCHAR2 datatype. The CHAR data type blank-pads and stores trailing blanks up to a fixed column length for all column values, while the VARCHAR2 datatype does not blank-pad or store trailing blanks for column values.

2. Use the CHAR data type when you require ANSI compatibility in comparison semantics (when trailing blanks are not important in string comparisons). Use the VARCHAR2 when trailing blanks are important in string comparisons.

Comparison Semantics

Use the CHAR data type when you require ANSI compatibility in comparison semantics (when trailing blanks are not important in string comparisons). Use the VARCHAR2 when trailing blanks are important in string comparisons.

Future Compatibility

1. The CHAR and VARCHAR2 data types are and will always be fully supported. At this time, the VARCHAR datatype automatically corresponds to the VARCHAR2 datatype and is reserved for future use.

CHAR, VARCHAR2, and LONG data is automatically converted from the database character set to the character set defined for the user session by the NLS_LANGUAGE parameter, where these are different.

Using the NUMBER Datatype

Use the NUMBER datatype to store real numbers in a fixed-point or floating-point format. Numbers using this data type are guaranteed to be portable among different Oracle platforms, and offer up to 38 decimal digits of precision. You can store positive and negative numbers of magnitude 1 x 10^-130 to 9.99...x10^125, as well as zero, in a NUMBER column.

For numeric columns you can specify the column as a floating-point number:

Column_name NUMBER

Or, you can specify a precision (total number of digits) and scale (number of digits to the right of the decimal point):

Column_name NUMBER (<precision>, <scale>)

Although not required, specifying the precision and scale for numeric fields provides extra integrity checking on input. If a precision is not specified, then the column stores values as given. Table shows examples of how data would be stored using different scale factors.

Using the DATE Datatype

Use the DATE datatype to store point-in-time values (dates and times) in a table. The DATE datatype stores the century, year, month, day, hours, minutes, and seconds.

Oracle uses its own internal format to store dates. Date data is stored in fixed-length fields of seven bytes each, corresponding to century, year, month, day, hour, minute, and second.

Date Format

For input and output of dates, the standard Oracle default date format is DD-MON-YY.

For example: '13-NOV-92'

To change this default date format on an instance-wide basis, use the NLS_DATE_FORMAT parameter. To change the format during a session, use the ALTER SESSION statement. To enter dates that are not in the current default date format, use the TO_DATE function with a format mask.

For example:

TO_DATE ('November 13, 1992', 'MONTH DD, YYYY')

If the date format DD-MON-YY is used, then YY indicates the year in the 20th century (for example, 31-DEC-92 is December 31, 1992). If you want to indicate years in any century other than the 20th century, then use a different format mask, as shown above.

Time Format

Time is stored in 24-hour format #HH:MM:SS. By default, the time in a date field is 12:00:00 A.M. (midnight) if no time portion is entered. In a time-only entry, the date portion defaults to the first day of the current month. To enter the time portion of a date, use the TO_DATE function with a format mask indicating the time portion, as in:

INSERT INTO Birthdays_tab (bname, bday) VALUES ('ANNIE',TO_DATE('13-NOV-92 10:56 A.M.','DD-MON-YY HH:MI A.M.'));

To compare dates that have time data, use the SQL function TRUNC if you want to ignore the time component.

Use the SQL function SYSDATE to return the system date and time. The FIXED_DATE initialization parameter allows you to set SYSDATE to a constant; this can be useful for testing.

Experiment No: 2

CO2:Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

AIM:

Creation, modification, configuration, and deletion of databases Commands

COMMANDS

Create Database

mysql> create database testdb;

Query OK, 1 row affected (0.01 sec)

Use Database created

mysql> use testdb;

Database changed

Create Table

create table student (stname varchar(30), stid varchar(10), stage int(2), starea varchar(20));

Query OK, 0 rows affected (0.34 sec)

Description of student

desc student;

```
+--------+-------------+------+-----+---------+-------
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------
| stname | varchar(30) | YES  |     | NULL    |       |
| stid   | varchar(10) | YES  |     | NULL    |       |
| stage  | int(2)      | YES  |     | NULL    |       |
| starea | varchar(20) | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------
4 rows in set (0.01 sec)
```

MODIFY TABLE DESCRIPTION

alter table student modify stage int(5);

Query OK, 0 rows affected (0.05 sec)

Records: 0 Duplicates: 0 Warnings: 0

desc student;

```
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| stname | varchar(30) | YES  |     | NULL    |       |
| stid   | varchar(10) | YES  |     | NULL    |       |
| stage  | int(5)      | YES  |     | NULL    |       |
| starea | varchar(20) | YES  |     | NULL    |       |
| stdept | varchar(20) | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

alter table student drop stdept;

Query OK, 0 rows affected (0.55 sec)

Records: 0 Duplicates: 0 Warnings: 0

desc student;

```
mysql> desc student;

+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| stname | varchar(30) | YES  |     | NULL    |       |
| stid   | varchar(10) | YES  |     | NULL    |       |
| stage  | int(5)      | YES  |     | NULL    |       |
| starea | varchar(20) | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

CLEAR ALL VALUES IN TABLE

truncate table student;

Query OK, 0 rows affected (0.25 sec)

mysql> desc student;

```
+--------+------------+------+-----+---------+-------+
| Field  | Type       | Null | Key | Default | Extra |
+--------+------------+------+-----+---------+-------+
| stname | varchar(30) | YES |     | NULL    |       |
| stid   | varchar(10) | YES |     | NULL    |       |
| stage  | int(5)      | YES |     | NULL    |       |
| starea | varchar(20) | YES |     | NULL    |       |
+--------+------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

DELETE TABLE BOTH SCHEMA AND DATA

drop table student;

Query OK, 0 rows affected (0.18 sec)

mysql> desc student;

ERROR 1146 (42S02): Table 'testdb.student' doesn't exist

DELETE DATABASE

mysql> DROP DATABASE databasename;

Database dropped

RESULT

Query has run successfully and result is obtained.

By constructing queries using SQL I was able to identify the queries for dealing with database activities.

PO1,PO2,PO3, PO5 attained

Ex. No : 3

CO2:Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

Export ER diagram from the database and verify relationships

AIM

Creation of database schema using DDL commands (create tables, set constraints, enforce relationships, create indices, delete and modify tables). Export ER diagram from the database and verify relationships**

Consider the employee database given below

emp (emp_id,emp_name, Street_No, city)
works (emp_id, company name, salary)
company (company name, city)
manages (emp_id, manager_id)

Note: Emp_id should start with 'E' in Emp table and emp_id in works table must be the emp_id from emp table . emp_id and manager_id in manages table must be the emp_id from emp table

I. Add these four tables with sufficient constraints.

II. Alter table emp add a constraint that emp_name cannot be null

III. Export ER diagram from database and verify relationships.

COMMANDS

I. A)Create table emp

```
Create table emp(emp_id char(8)  J primary key, emp_name
varchar(18),street_no int,city varchar(18));
```

B) Create table company

```
Create table company(company_name varchar(18) primary key, city varchar(18));
```

C) Create table works

```
Create table works(emp_id char(8) references emp(emp_id),company_name
varchar(18) references company(company_name),salary float,primary
key(emp_id,company_name));
```

D) Create table manages

```
Create table manages(emp_id char(8) references emp(emp_id),manager_id char(8)
references emp(emp_id),unique(emp_id,manager_id));
```

II. Alter table emp
alter table emp MODIFY emp_name varchar(18) NOT NULL;
III. Export ER Diagram

RESULT

Query has run successfully and result is obtained.

By constructing queries using SQL I was able to identify the queries for dealing with database activities.

Ex. No : 4

CO2:Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

Database initialization - Data insert, Data import to a database (bulk import using UI and SQL Commands)**.

AIM

To insert data to tables used in experiment no 3 using insert commands and bulk import using UI and sql commands.

COMMANDS

1. INSERT COMMANDS

```
insert into emp values('E-101','Adarsh',101,'MG Road');
insert into emp values('E-102','Bonny',101, 'MG Road');
insert into emp values('E-103','Catherine', 102, 'Cochin');
insert into emp values('E-104','Glenn', 104, 'Ernakulam');
insert into emp values('E-105','George',  201,'MG Road');
insert into emp values('E-106','Hayes', 101, 'MG Road');
insert into emp values('E-107','Johnson',102,'Cochin');
insert into emp values('E-108','Jones',  101, 'Cochin');
insert into emp values('E-109','Karthik',  101, 'Ernakulam');
insert into emp values('E-110','Lavanya',  101, 'Palace Road');
insert into emp values('E-111','Niharika',  102, 'Ernakulam');


insert into company values('SBI',   'MG Road');
insert into company values('SBT',   'MG Road' );
insert into company values('Federal','Broadway');
insert into company values('Indian Bank', 'Cochin');
insert into company values('SIB', 'Ernakulam');
insert into company values('HDFC',  'Palace Road');
insert into company values('Axis','Cochin');
insert into company values('City bank', 'Ernakulam');


insert into works values('E-101',   'SBI',    71000);
insert into works values('E-102',   'SBI',    90000);
insert into works values('E-103',     'SBT',    40000);
insert into works values('E-104', 'Federal',         37000);
insert into works values('E-105', 'SBT',   17000);
```

```
insert into works values('E-106',     'Indian Bank',   30000);
insert into works values('E-107',    'SIB',   21000);
insert into works values('E-108', 'SIB',   18000);
insert into works values('E-109', 'Indian Bank',   28000);
insert into works values('E-110', 'SBT',  250000);
insert into works values('E-111', 'Federal',         40000);


insert into manages values('E-101', 'E-102');
insert into manages values('E-102', Null);
insert into manages values('E-103', 'E-110');
insert into manages values('E-104', 'E-111');
insert into manages values('E-105', 'E-110');
insert into manages values('E-106', 'E-109');
insert into manages values('E-107', Null);
insert into manages values('E-108', Null);
insert into manages values('E-109',Null);
insert into manages values('E-110', Null);
insert into manages values('E-111', null);
```

Export table values to a text file

First see where is the path set for secure_file_priv, we can do export and import in this location only(else need to configure it) so use following command:

```
mysql>SHOW VARIABLES LIKE 'secure_file_priv';

+------------------+----------------------+

| Variable_name    | Value                |

+------------------+----------------------+|

secure_file_priv | /var/lib/mysql-files/

|+------------------+----------------------+|


1 row in set (0.00 sec)


mysql> SELECT * FROM WORKS INTO

+"/var/lib/mysql-files/out2.txt";
```

Query OK, 0 rows affected (0.06 sec)

To show the contents of the file to which data is exported use cat

virgo@virgo-Vostro-230:~$ sudo cat "/var/lib/mysql-files/out2.txt"

e101 sbt 1000

Load values from a text file to SQL Table

mysql> LOAD DATA INFILE "/var/lib/mysql-files/out2.txt" INTO TABLE EMP4.WORKS;

Query OK, 1 row affected (0.05 sec)

Records: 1 Deleted: 0 Skipped: 0 Warnings: 0

RESULT

Query has run successfully and result is obtained.

By constructing queries using SQL I was able to identify the queries for dealing with database activities.

Ex. No : 5

CO2:Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

Practice SQL commands for DML (insertion, updating, altering, deletion of data, and viewing/querying records based on condition in databases)

AIM

Consider the employee database created in Find results for the following questions
a. Find the names of all employees who work for SBI.
b. Find all employees in the database who live in the same cities as the companies for which they work.
c. Find all employees and their managers in the database who live in the same cities and on the same street number as do their managers.
d. Find all employees who earn more than the average salary of all employees of their company.
e. Find the company that pay least total salary along with the salary paid.
f. Give all managers of SBI a 10 percent raise.
g. Find the company that has the most employees
h. Find those companies whose employees earn a higher salary, on average than the average salary at Indian Bank.
i. Query to find name and salary of all employees who earn more than each employee of 'Indian Bank'

COMMANDS

a) Find the names of all employees who work for SBI.

```
SELECT emp_name FROM works,emp WHERE company_name='SBI'
and emp.emp_id=works.emp_id;

EMP_NAME
----------
Adarsh
```

b) Find all employees in the database who live in the same cities as the companies for which they work.

```
SELECT emp.emp_name FROM emp, works,company WHERE
```

emp.emp_id = works. emp_id AND works. company_name=
company.company_name AND emp.city = company.city

EMP_NAME

Adarsh
George

c) Find all employees and their managers in the database who live in the same cities and on the same street number as do their managers.

SELECT emp.emp_name,e2.emp_name "manager name" FROM emp,emp e2, manages WHERE emp.emp_id = manages.emp_id AND e2.Emp_id= manages.manager_id AND emp.street_no = e2.street_no AND emp.city = e2.city

EMP_NAME	manager name
Adarsh	Bonny

d) Find all employees who earn more than the average salary of all employees of their company.

SELECT emp_name,emp.emp_id,salary FROM works ,emp WHERE salary > (SELECT AVG (salary) FROM works S WHERE works.company_name =S.company_name) and emp.emp_id=works.emp_id

EMP_NAME	EMP_ID	SALARY
Bonny	E-102	90000
Hayes	E-106	30000
Johnson	E-107	21000
Lavanya	E-110	250000
Niharika	E-111	40000

e). Find the company that pay least total salary along with the salary paid.
SELECT company_name,sum(salary) "SALARY PAID" from Works GROUP BY company_name HAVING sum(salary) <= all (SELECT sum(salary) FROM Works GROUP BY company_name)

COMPANY_NAME	SALARY PAID
SIB	39000

f.) Give all managers of SBI a 10 percent raise.

UPDATE works SET salary = salary * 1.1 WHERE emp_id in (select manager_id from manages) and company_name ='SBT';

g). Find the company that has the most employees

```
SELECT company_name FROM works  GROUP BY company_name
HAVING COUNT (DISTINCT emp_id) >= ALL (SELECT COUNT (DISTINCT
emp_id) FROM works GROUP BY company_name)
```

```
COMPANY_NAME
------------------
SBT
```

h) Find those companies whose employees earn a higher salary, on average than the average salary at Indian Bank.

```
SELECT company_name FROM works GROUP BY company_name HAVING
AVG(salary)> (SELECT AVG(salary) FROM  works WHERE company_name =
'Indian Bank' GROUP BY
company_name)
```

```
COMPANY_NAME
------------------
SBI
Federal
SBT
```

i).Query to find name and salary of all employees who earn more than each employee of 'Indian Bank'

```
SELECT emp_name,salary  FROM works,emp
WHERE salary > (SELECT MAX(salary)  FROM works WHERE company_name =
'Indian Bank' GROUP BY company_name) and emp.emp_id=works.emp_id;
```

EMP_NAME	SALARY
Adarsh	71000
Bonny	99000
Catherine	40000
Glenn	37000
Lavanya	250000
Niharika	40000

Ex. No : 6

CO2:Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

Implementation of built-in functions in RDBMS

AIM

RDBMS Built in Functions

There are two types of functions:

1) Single Row Functions: Single row or Scalar functions return a value for every row that is processed in a query.

2) Group Functions: These functions group the rows of data based on the values returned by the query. This is discussed in SQL GROUP Functions. The group functions are used to calculate aggregate values like total or average, which return just one total or one average value after processing a group of rows.

There are four types of single row functions. They are:

1) Numeric Functions: These are functions that accept numeric input and return numeric values.

2) Character or Text Functions: These are functions that accept character input and can return both character and number values.

3) Date Functions: These are functions that take values that are of datatype DATE as input and return values of datatype DATE, except for the MONTHS_BETWEEN function, which returns a number.

4) Conversion Functions: These are functions that help us to convert a value in one form to another form. For Example: a null value into an actual value, or a value from one datatype to another datatype like NVL, TO_CHAR, TO_NUMBER, TO_DATE etc.

Mathematical Functions

```
SQL> select ABS(-100) from dual;
ABS(-100)
----------
100
SQL> select ABS(-6) from dual;
```

```
ABS(-6)
----------
6
SQL> select FLOOR(2345.78) FROM DUAL;
FLOOR(2345.78)
--------------
 2345
SQL> SELECT GREATEST(23,67,90,123,78,50) FROM DUAL;
GREATEST(23,67,90,123,78,50)
----------------------------
123
SQL> SELECT LEAST(34, 21,67,11,89,9) FROM DUAL;
LEAST(34,21,67,11,89,9)
 9
SQL> SELECT LENGTH('RAJESHWARI') FROM DUAL;
LENGTH('RAJESHWARI')
--------------------
10
SQL> SELECT LENGTH(17245637) FROM DUAL;
LENGTH(17245637)
----------------
8
SQL> SELECT SQRT(16) FROM DUAL;
SQRT(16)
----------
4
SQL> SELECT SQRT(99) FROM DUAL;
SQRT(99)
 9.94987437
SQL> SELECT POWER(2,4) FROM DUAL;
POWER(2,4)
----------
16
SQL> SELECT POWER(2,10) FROM DUAL;
POWER(2,10)
-----------
1024
SQL> SELECT power(2,10) FROM DUAL;
POWER(2,10)
-----------
1024
SQL> SELECT ROUND(5.86) FROM DUAL;
ROUND(5.86)
-----------
6
SQL> SELECT ROUND(1001.6) FROM DUAL;
ROUND(1001.6)
```

```
-------------
1002
SQL> SELECT ROUND(1001.3) FROM DUAL;
ROUND(1001.3)
-------------
1001
SQL> SELECT SIN(90) FROM DUAL;
SIN(90)
----------
.893996664
SQL> SELECT COS(45) FROM DUAL;
COS(45)
----------
.525321989
SQL> SELECT TAN(30) FROM DUAL;
TAN(30)
----------
-6.4053312
SQL> SELECT TAN(90) FROM DUAL;
TAN(90)
----------
-1.9952004
SQL> SELECT TAN(180) FROM DUAL;
TAN(180)
----------
1.33869021
SQL> SELECT SIGN(-128) FROM DUAL;
SIGN(-128)
----------
-1
SQL> SELECT SIGN(10) FROM DUAL;
SIGN(10)
----------
1
SQL> SELECT SIGN(0) FROM DUAL;
SIGN(0)
----------
0
SQL> SELECT LN(100) FROM DUAL;
LN(100)
----------
4.60517019
SQL> SELECT LN(10) FROM DUAL;
LN(10)
----------
2.30258509
SQL> SELECT LOG(10,100) FROM DUAL;
```

```
LOG(10,100)
-----------
2
SQL> SELECT LOG(100,10) FROM DUAL;
LOG(100,10)
-----------
.5
SQL> SELECT MOD(4,3) FROM DUAL;
MOD(4,3)
----------
1
SQL> SELECT MOD(4,2) FROM DUAL;
MOD(4,2)
----------
0
SQL> SELECT EXP(2) FROM DUAL;
EXP(2)
----------
7.3890561
SQL> SELECT EXP(-2) FROM DUAL;
EXP(-2)
----------
.135335283
SQL> SELECT EXP(0) FROM DUAL;
EXP(0)
----------
1
```

Date Functions

```
SQL> SELECT CURRENT_DATE FROM DUAL;
CURRENT_D
---------
14-AUG-19
SQL> SELECT EXTRACT(YEAR FROM SYSDATE) FROM DUAL;
EXTRACT(YEARFROMSYSDATE)
------------------------
2019
SQL> SELECT EXTRACT(DAY FROM SYSDATE) FROM DUAL;
EXTRACT(DAYFROMSYSDATE)
-----------------------
14
SQL> SELECT EXTRACT(MONTH FROM SYSDATE) FROM DUAL;
EXTRACT(MONTHFROMSYSDATE)
-------------------------
8
```

```
SQL> SELECT SYSDATE FROM DUAL;
SYSDATE
---------
AUG-19
```

String Functions

```
SQL> select ascii('t') from dual;
ASCII('T')
----------
116
SQL> select ascii('a') from dual;
ASCII('A')
----------
97
SQL> select ascii('A') from dual;
ASCII('A')
----------
65
SQL> select ascii('Z') from dual;
ASCII('Z')
----------
90
SQL> select ascii('z') from dual;
ASCII('Z')
----------
122
SQL> SELECT UPPER('bldea sb arts and kcp science college') from dual;
UPPER('BLDEASBARTSANDKCPSCIENCECOLLEG')
-----------------------------------
BLDEA SB ARTS AND KCP SCIENCE COLLEGE
SQL> select LOWER('welcome to dbms lab') from dual;
LOWER('WELCOMETODBM
-------------------
welcome to dbms lab
SQL> select LOWER('WELCOME TO DBMSLAB') from dual;
LOWER('WELCOMETODB
------------------
welcome to dbmslab
SQL> SELECT REPLACE('HELLO','H','K') FROM DUAL;
REPLA
-----
KELLO
SQL> SELECT REPLACE('COMPUTER','C','K') FROM DUAL;
REPLACE( --------
KOMPUTER
SQL> SELECT REPLACE('HELLO','L','A') FROM DUAL;
```

```
REPLA
-----
HEAAO
SQL> SELECT TRIM('A' FROM 'ANACONDA') FROM DUAL;
TRIM('
--
NACOND
SQL> SELECT LTRIM('ANACONDA','A') FROM DUAL;
LTRIM('
-------
NACONDA
SQL> SELECT LTRIM('ANIL','A') FROM DUAL;
LTR
---
NIL
SQL> SELECT RTRIM('ANITA','A') FROM DUAL;
RTRI
---
ANIT
SQL> SELECT RTRIM('ANACONDA','A') FROM DUAL;
RTRIM('
-------
ANACOND
SQL> SELECT RTRIM('ANACONDA ','A') FROM DUAL;
RTRIM('ANAC
-----------
ANACONDA
```

Ex. No : 7

Implementation of various aggregate functions in SQL

CO2: Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

AIM

Create the tables with the following fields

Faculty (FacultyCode, FacultyName)
Subject (SubjectCode,SubjectName,MaxMark,FacultyCode)
Student(StudentCode,StudentName,DOB,StudentsBranch(CS/EC/EE/ME), AdmissionDate)
M_Mark (StudentCode, SubjectCode, Mark)

Do the following queries

a) Display the number of faculties.
b) Display the total mark for each student.
c) Display the subject,average mark for each subject.
d) Display the name of subjects for which atleast one student got below 40%.
e) Display the name,subject and percentage of mark who got below 40 %.
f) Display the faculties and alloted subjects for each faculty
g) Display the name of faculties who take more than one subject.
h) Display name,subject,mark, % of mark in ascending order of mark

Commands

```
Create Table Faculty (F_Code Number Primary Key, F_Name Varchar(15));
        insert into Faculty values(&facultycode,'&facultyname');
```

SELECT * **FROM** Faculty;

F_CODE	F_NAME
105	Jayakumar
104	Sangeetha

102	Bindu
101	Silgy
103	Vidhya

create table Subject (subjectcode varchar(5) primary key not null,subjectname char(15),maxmark number(5,2),faculty_code int,foreign key(faculty_code) references Faculty(f_code));

insert into Subject values('&subjectcode','&subjectname',&maxmark,&facultycode);

SUBJECTCODE	SUBJECTNAME	MAXMARK	FACULTYCODE
503	DBMS	100	105
501	Maths	150	101
502	FSA	100	102
504	OS	75	103
505	DC	200	104
508	DBMS lab	1001	103

create table Student(studentcode varchar(5) primary key not null,studentname char(15),dob date,studentbranch char(3),adate date,check(studentbranch in('cs','ec','ee','me')));

insert into Student values('&studentcode','&studentname','&dob','&studentbranch','&adate');

Enter value for studentcode: 1
Enter value for studentname: Amitha
Enter value for dob: 12-jan-1987
Enter value for studentbranch: cs
Enter value for adate: 1-jun-2000
old 1: insert into Student
values('&studentcode','&studentname','&dob','&studentbranch','&adate')
new 1: insert into Student values('1','Amitha','12-jan-1987','cs','1-jun-2000')
insert into student values(2,’vaidehi’,’25-dec-88’,’me’,’1-jun-2000’);
insert into student values(3,’varun’,’2-oct-88’,’me’,’2-jun-2000’);
insert into student values(4,’turner’,’5-sep-88’,’ec’,’1-jun-2000’);
insert into student values(5,’vani’,’20-jul-88’,’ee’,’5-jun-2000’);
insert into student values(6,’binu’,’13-aug-88’,’me’,’10-jun-2000’);
insert into student values(7,’chitra’,’14-nov-86’,’me’,’9-jun-1999’);
insert into student values(8,’dona’,’2-dec-91’,’cs’,’2-jun-2000’);
insert into student values(9,’elana’,’5-feb-90’,’cs’,’1-jun-2000’);
insert into student values(10,’fahan’,’20-mar-88’,’ec’,’5-jun-2000’);
insert into student values(11,’ginu’,’13-apr-88’,’ec’,’10-jun-2000’);
insert into student values(12,’hamna’,’14-may-85’,’ee’,’9-jun-1999’);

create table M_mark(studentcode varchar(5) references Student(studentcode),subjectcode varchar(5) references Subject(subjectcode),mark number(5,2),primary key(studentcode,subjectcode));

insert into M_mark values('&studentcode','&subjectcode',&mark);

insert into M_mark values(1,501,40);
insert into M_mark values(1,502,70);
insert into M_mark values(1,503,50);
insert into M_mark values(1,504,80);
insert into M_mark values(1,505,40);
insert into M_mark values(1,508,70);
insert into M_mark values(2,501,90);
insert into M_mark values(2,502,89);
insert into M_mark values(2,503,77);
insert into M_mark values(2,504,95);
insert into M_mark values(2,505,74);
insert into M_mark values(2,508,98);
insert into M_mark values(3,501,40);
insert into M_mark values(3,502,43);
insert into M_mark values(3,503,40);
insert into M_mark values(3,504,40);
insert into M_mark values(3,505,40);
insert into M_mark values(3,508,35);
insert into M_mark values(4,501,50);
insert into M_mark values(5,501,60);
insert into M_mark values(6,501,67);
insert into M_mark values(7,501,23);
insert into M_mark values(8,501,43);
insert into M_mark values(9,501,42);
insert into M_mark values(10,505,74);
insert into M_mark values(11,508,98);
insert into M_mark values(12,501,40);
insert into M_mark values(5,502,43);
insert into M_mark values(6,503,40);
insert into M_mark values(7,504,40);
insert into M_mark values(8,505,40);
insert into M_mark values(9,508,35);
insert into M_mark values(10,501,50);
insert into M_mark values(11,501,60);
insert into M_mark values(12,503,67);
insert into M_mark values(5,504,23);
insert into M_mark values(6,504,23);
insert into M_mark values(9,504,1);
insert into M_mark values(10,504,1);
insert into M_mark values(6,502,43);
insert into M_mark values(7,505,42);

a) Display the number of faculties.

select count(*) “No: of Faculties” from faculty;

No: of Faculties
5

b) Display the total mark for each student.

select studentname,sum(mark) “Total Mark” from M_mark,Student where Student.studentcode= M_mark.studentcode group by studentname;

STUDENTNAME	SUM(MARK)
binu	150
hamna	107
turner	50
fahan	124
vaidehi	523
chitra	105
Amitha	350
ginu	158
varun	238
vani	126
dona	83
elana	77

c) Display the subject,average mark for each subject.

select subjectname,round(avg(mark),2) “Average mark” from Subject,M_mark where Subject.subjectcode= M_mark.subjectcode group by subjectname;

SUBJECTNAME	**Average mark**
DBMS lab	67.2
DC	51.67
FSA	57.6
DBMS	54.8
Maths	50.42
OS	55.6

d) Display the name of subjects for which atleast one student got below 40%.

select subject.subjectname,count(student1.studentname)”NO: OF STUDENTS” from subject,m_mark,student1 where student1.studentcode= m_mark.studentcode and m_mark.mark<(40* maxmark)/100 and subject.SubjectCode=m_mark.Subjectcode group by subject. Subjectname having count(distinct(m_mark.subjectcode))>=1;

SUBJECTNAME	**NO: OF STUDENTS**
DBMS lab	**2**

Maths	**1**
OS	**4**

e) Display the name,subject and percentage of mark who got below 40 %.

select **studentname**, **subjectname**,mark,maxmark,round((m_mark.mark/maxmark)*100,2)"Percentage" from subject, student1, m_mark where mark<(40*maxmark/100) and subject. SubjectCode = m_mark. subjectcode and student1.**studentcode** =m_mark.studentcode;

f) Display the faculties and alloted subjects for each faculty.

select Faculty.f_name,Subject.subjectname from Faculty,Subject where Faculty.F_code=Subject.FACULTYCODE;

F_NAME	SUBJECTNAME
Vidhya	DBMS lab
Jayakumar	DBMS
Silgy	Maths
Bindu	FSA
Vidhya	OS
Sangeetha	DC

g) Display the name of faculties who take more than one subject.

Select f_name name from Faculty where (select count(subjectcode) from Subject where Subject.facultycode=Faculty.f_code)>1 group by Faculty.f_name;

or

select Faculty.f_name,count(subject.SubjectCode) "NO OF SUBJECTS" from Faculty,subject where (select count(*) from Subject where Subject.facultycode=Faculty.f_code)>1 and Subject.facultycode=Faculty.f_code group by Faculty.f_name;

F_NAME	NO OF SUBJECTS
Vidhya	2

h) Display name,subject,mark, % of mark in ascending order of mark

select studentname,subjectname,mark from Student1,Subject,M_mark where Student1.studentcode=M_mark.studentcode and Subject.subjectcode= M_mark.subjectcode order by mark;

Ex. No : 8

Implementation of Order By, Group By & Having clause

CO2: Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

AIM

Create two tables

Dept(Department_Id, Department_Name , Manager_id, Loc)

Emp(Emp_no , Emp_name,Job , Salary , Hiredate,Comm , Depno)

MANAGER_ID is the empno of the employee whom the employee reports to. DEPTNO is a foreign key.Insert these values into department table

1) Display the name and salary for all employees whose salary is not in the range of 5000 and 35000

2) Display the employee name, job ID, and start date of employees hired between February 20, 1990, and May 1, 1998. Order the query in ascending order by start date.

3) list the name and salary of employees who earn between 5,000 and12,000, and are in department 2 or 4. Label the columns Employee and Monthly Salary,respectively.

4)Display the name and hire date of every employee who was hired in 1994.

5). Display the name, salary, and commission for all employees who earn commissions. Sort data in descending order of salary and commissions.

6) Display the name and job title of all employees who do not have a manager.

7). Display the names of all employees where the third letter of the name is an *a*.

8). Display the name of all employees who have an *a* and an *e* in their name.

9). Display the name, job, and salary for all employees whose job is sales representative or stock clerk and whose salary is not equal to 2,0000, 4000, or 7,000.

10)Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase and the length of the name for all employees whose name starts with *J*, *A*, or *M*. Give each column an appropriate label. Sort the results by the employees' names.

11)For each employee, display the employee's name, and calculate the number of months between today and the date the employee was hired and years worked. Label the column

MONTHS_WORKED. Order your results by the number of months employed. Round the number of months and year up to the closest whole number.

12). Write a query to display the name, department number, and department name for all employees.

13) Create a query to display the name and hire date of any employee hired after employee Mathew

14) Display the names and hire dates for all employees who were hired before their managers, along with their manager's names and hire dates. Label the columns Employee, EmpHired, Manager, and Mgr Hired, respectively.

15) Write a query to display the number of people with the same job.
16). Display the manager number and the salary of the lowest paid employee for that manager.Exclude anyone whose manager is not known. Exclude any groups where the minimum salary is less than 6,000. Sort the output in descending order of salary.

17. Write a query to display each department's name, location, number of employees, and the average salary for all employees in that department. Label the columns Name, Location, Number of People, and Salary, respectively. Round the average salary to two decimal places.

18). Write a query to display the name and hire date of any employee in the same department as amit. Exclude JOHN.

19. Write a query that displays the employee numbers names of all employees who work in a department with any employee whose name contains a *u*.

20)display employee name and department name of all employees that work in a department that has at least 3 employees. Order the list in alphabetical order first by department name, then by employee name.

21. Write a query to list the length of service of the employees (of the form n years and m months).

COMMANDS

CREATE TABLE dept(department_id int primary key , department_name VARCHAR(20) NOT NULL , manager_id int, loc varchar(10));

create table emp(EMP_no int Primary Key,Emp_Name Varchar(10),Job Varchar(10),Hiredate Date,Salary Float,Comm Float,Depno Int References Dept(Department_Id));

INSERT INTO emp VALUES(1,'Steven', 'Marketing','06-jan-1995',24000, NULL,2);
INSERT INTO emp VALUES(2,'Neena', 'FI_ACCOUNT', '06-feb-1987',34000, NULL,1);
INSERT INTO emp VALUES(3,'Lex', 'FI_MGR', '06-jan-1980',240000, NULL,1);

INSERT INTO emp VALUES(4,'Alexander', 'Sa_Rep', '06-jun-1987',20000, NULL,4);
INSERT INTO emp VALUES(5,'Bruce', 'IT_PROG', '06-jul-1990',24000, NULL,4);
INSERT INTO emp VALUES(6,'David', 'IT_PROG', '06-sep-1991',22000, NULL,4);
INSERT INTO emp VALUES(7,'vipin', 'IT_PROG', '16-nov-1987',28000, NULL,4);
INSERT INTO emp VALUES(8,'Diana', 'Pur_Man', '26-jan-1987',24000, NULL,3);
INSERT INTO emp VALUES(9,'John', 'FI_ACCOUNT', '1-dec-1992', 24000, NULL,1);
INSERT INTO emp VALUES(10,'Ismael', 'CLERK', '29-mar-1994', 4000, NULL,3);
INSERT INTO emp VALUES(11,'Mathew', 'CLERK', '12-oct-1992', 46000, 200,3);
INSERT INTO emp VALUES(12,'Hayes', 'Marketing', '21-apr-1998',14000, 1000,2);
INSERT INTO emp VALUES(13,'sarun', 'Marketing', '18-may-1993',18000, NULL,2);
INSERT INTO emp VALUES(14,'Henin','FI_MGR', '06-aug-1980',240000, NULL,1);
INSERT INTO emp VALUES(15,'Greesh','Clerk', '06-aug-1980',240000, NULL,5);

INSERT INTO dept values(1, 'Administration', null, 'Boston');
INSERT INTO dept values(2, 'Marketing', null, 'Boston');
INSERT INTO dept values(3, 'Purchase', null, 'perryridge');
INSERT INTO dept values(4, 'Programming',null, 'Hudson');
INSERT INTO dept values(5, 'HR', null, 'Hudson');

Alter table dept add foreign key(manager_id references emp(emp_id));

Update dept set manager_id=2 **where** department_id=1;
Update dept set manager_id=1 **where** department_id=2;
Update dept set manager_id=8 **where** department_id=3;
Update dept set manager_id=7 **where** department_id=4;

1) Display the name and salary for all employees whose salary is not in the range of 5000 and 35000

SELECT emp_name, salary FROM emp WHERE salary NOT BETWEEN 5000 AND 35000;

EMP_NAME	SALARY
Lex	240000
Ismael	4000
Mathew	46000
Henin	240000

2) Display the employee name, job ID, and start date of employees hired between February 20, 1990, and May 1, 1998. Order the query in ascending order by start date.

SELECT emp_name, job, hiredate FROM emp WHERE hiredate BETWEEN '20-Feb-1990' AND '01-May-1998' ORDER BY hiredate

EMP_NAME	JOB	HIREDATE
Bruce	IT_PROG	06-JUL-90

David	IT_PROG	06-SEP-91
Mathew	CLERK	12-OCT-92
John	FI_ACCOUNT	01-DEC-92
Steven	Marketing	18-MAY-93
Ismael	CLERK	29-MAR-94
Hayes	Marketing	21-APR-98

3) list the name and salary of employees who earn between 5,000 and12,000, and are in department 2 or 4. Label the columns Employee and Monthly Salary,respectively.

SELECT emp_name "Employee", salary "Monthly Salary" ,depno FROM emp WHERE salary BETWEEN 5000 AND 30000 AND depno IN (2, 4);

Employee	**Monthly Salary**
==========	==========
Alexander	20000
Bruce	24000
vipin	28000
Hayes	14000
Steven	18000
David	22000

4)Display the name and hire date of every employee who was hired in 1994.
SELECT emp_name, hiredate FROM emp WHERE hiredate LIKE '%94';

EMP_NAME	**HIREDATE**
==========	=========
Ismael	29-MAR-94

5). Display the name, salary, and commission for all employees who earn commissions. Sort data in descending order of salary and commissions.

SELECT emp_name, salary, comm FROM emp WHERE comm >0
ORDER BY salary DESC, comm DESC;

Or

SELECT emp_name, salary, comm FROM emp WHERE comm IS NOT NULL
ORDER BY salary DESC, comm DESC;

EMP_NAME	**SALARY**	**COMM**
==========	==========	==========
Mathew	46000	200
Hayes	14000	1000

6) Display the name and job title of all employees who do not have a manager.

SELECT emp_name, job FROM emp,dept WHERE manager_id IS NULL and emp.depno=dept.department_id;

EMP_NAME	JOB
Greesh	Clerk

7). Display the names of all employees where the third letter of the name is an *a*.

SELECT emp_name FROM emp WHERE emp_name LIKE '__a%';

EMP_NAME
Diana

8). Display the name of all employees who have an *a* and an *e* in their name.

SELECT emp_name FROM emp WHERE emp_name LIKE '%a%' AND emp_name LIKE '%e%';

EMP_NAME
Neena
Alexander
Ismael
Mathew
Hayes

9). Display the name, job, and salary for all employees whose job is sales representative or stock clerk and whose salary is not equal to 2,0000, 4000, or 7,000.

SELECT emp_name, job, salary FROM emp WHERE job IN ('Sa_rep', 'CLERK') AND salary NOT IN (2000, 4000, 7000);

EMP_NAME	JOB	SALARY
Alexander	Sa_rep	20000
Mathew	CLERK	46000

10)Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase and the length of the name for all employees whose name starts with *J, A,* or *M*. Give each column an appropriate label. Sort the results by the employees' names.

SELECT INITCAP(emp_name) "Name", LENGTH(emp_name) "Length" FROM emp

WHERE emp_name LIKE 'J%' OR emp_name LIKE 'M%' OR emp_name LIKE 'A%'ORDER BY emp_name;

Name	Length
Alexander	9
John	4
Mathew	6

11)For each employee, display the employee's name, and calculate the number of months between today and the date the employee was hired and years worked. Label the column MONTHS_WORKED. Order your results by the number of months employed. Round the number of months and year up to the closest whole number.

.

SELECT emp_name**, ROUND(MONTHS_BETWEEN(SYSDATE, hiredate))** MONTHS_WORKED**, round(MONTHS_BETWEEN(SYSDATE, hiredate)/12,2) "NO: Of YEARS" FROM** emp **ORDER BY MONTHS_BETWEEN(SYSDATE, hiredate);**

12). Write a query to display the name, department number, and department name for all employees.

SELECT emp.emp_name, emp.depno, dept.department_name FROM emp , dept WHERE emp.depno = dept.department_id order by dept.department_name;

13) Create a query to display the name and hire date of any employee hired after employee Mathew

SELECT emp_Name, HireDate **FROM** Emp **WHERE** ((HireDate)>**any(SELECT** HireDate **FROM** Emp **WHERE** emp_Name='Mathew'**));**

EMP_NAME	HIREDATE
Hayes	21-APR-98
Ismael	29-MAR-94
Steven	18-MAY-93
John	01-DEC-92

14) Display the names and hire dates for all employees who were hired before their managers, along with their manager's names and hire dates. Label the columns Employee, EmpHired, Manager, and Mgr Hired, respectively.

SELECT emp.emp_name employee , emp.hiredate "EMP HIRE DATE", emp.salary, manager.emp_name manager, manager.hiredate "MANAGER HIRE DATE" **FROM emp , dept, emp manager WHERE dept.manager_id = manager.emp_no and emp.depno=dept.department_id and emp.hiredate < manager.hiredate;**

EMPLOYEE	EMP HIRE DATE	MANAGER	MANAGER HIRE DATE
Lex	06-JAN-80	Neena	06-FEB-87
Alexander	06-JUN-87	vipin	16-NOV-87
Steven	18-MAY-93	Steven	06-JAN-95
Henin	06-AUG-80	Neena	06-FEB-87

15) Write a query to display the number of people with the same job.
SELECT job, **COUNT(*)** "No: of Jobs" **FROM** emp **GROUP BY** job;

JOB	NO: OF JOBS
IT_PROG	4
Pur_Man	1
CLERK	2
FI_ACCOUNT	2
FI_MGR	2
Marketing	3

16). Display the manager number and the salary of the lowest paid employee for that manager.Exclude anyone whose manager is not known. Exclude any groups where the minimum salary is less than 6,000. Sort the output in descending order of salary.

SELECT min(salary) "MINIMUM SALARY",manager_id, department_name **FROM** emp,dept **where** emp.depno=dept.department_id **AND** manager_id **IS NOT NULL**
GROUP BY manager_id, department_name **HAVING MIN(salary) > 6000**
ORDER BY "MINIMUM SALARY" **DESC**

MINIMUM SALARY	MANAGER_ID	DEPARTMENT_NAME
24000	2	Administration
20000	7	Programming
14000	1	Marketing

select emp_name "manager",emp.depno,emp.emp_no, (**select** min(salary) **from** emp e **where** (emp.depno=e.depno) **group by** e.depno having min(salary)>15000) "salary" **from** emp,dept **where** emp.emp_no=dept. MANAGER_ID and emp.depno=dept. DEPARTMENT_ID

select emp_name "manager", (select min(salary) from emp e where (emp.depno=e.depno) group by e.depno having min(salary)>13000) "salary" from emp,dept where emp.emp_no=dept. MANAGER_ID and emp.depno=dept. DEPARTMENT_ID

select min(emp.salary) from emp,emp e where (emp.depno=e.depno) group by e.depno having min(emp.salary)>15000

17. Write a query to display each department's name, location, number of employees, and the average salary for all employees in that department. Label the columns Name, Location, Number of People, and Salary, respectively. Round the average salary to two decimal places.

SELECT d.department_name "Name", d.loc "Location ",
COUNT(*) "Number of People", ROUND(AVG(salary),2) "Salary"
FROM emp e, dept d
WHERE e.depno = d.department_id GROUP BY d.department_name, d.loc;

Name	Location	Number of People	Salary
Administration	Boston	4	134500
Marketing	Boston	3	18666.67
Programming	Hudson	4	23500
Purchase	perryridge	3	24666.67

18). Write a query to display the name and hire date of any employee in the same department as amit. Exclude JOHN.

SELECT emp_name, hiredate **FROM** emp **WHERE** depno = **(SELECT** depno **FROM** emp **WHERE** emp_name = 'John'**) and** emp_name<>'John'**;**

EMP_NAME	HIREDATE
Neena	06-FEB-87
Lex	06-JAN-80
Henin	06-AUG-80

19. Write a query that displays the employee numbers names of all employees who work in a department with any employee whose name contains a *u*.

SELECT emp_no, emp_name,department_name **FROM** emp,dept
WHERE depno **IN (SELECT depno FROM** emp **WHERE** emp_name **like '%u%') and** emp.depno=dept.department_id**;**

EMP_NO	EMP_NAME	DEPARTMENT_NAME
6	David	Programming
7	vipin	Programming
5	Bruce	Programming
4	Alexander	Programming

20)display employee name and department name of all employees that work in a department that has at least 3 employees. Order the list in alphabetical order first by department name, then by employee name.

SELECT Emp_name, department_name **FROM** emp, dept **WHERE** emp.depno = dept.department_id **AND** emp.depno in (**SELECT** depno **FROM** emp **GROUP BY** depno **HAVING** count(*) >4) **ORDER BY** department_name, emp_name;

21. Write a query to list the length of service of the employees (of the form n years and m months).

SELECT emp_name "employee",to_char(trunc(months_between(sysdate,hiredate)/12))||' years '|| to_char(trunc(mod(months_between (sysdate, hiredate),12)))||' months ' "length of service" **FROM** emp;

Ex. No : 9

Implementation of set operators nested queries, and join queries

CO2: Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

AIM

Consider the schema for MovieDatabase:

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 moremovies.
3. List all actors who acted in a movie before 2000 and also in a movieafter 2015 (use JOINoperation).
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' to5.

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)); Act_Gender Mov_Year Mov_Lang Dir_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));

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);

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 moremovies. 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 JOINoperation).

SELECT ACT_NAME, MOV_TITLE, MOV_YEAR

FROM ACTOR A JOIN

MOVIE_CASTC

ON A.ACT_ID=C.ACT_ID

JOIN MOVIESM

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’ to5 KL

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
```

Ex. No : 10

Practice of SQL TCL commands like Rollback, Commit, Savepoint

CO2: Construct queries using SQL for database creation, interaction, modification, and

updation. (Cognitive Knowledge Level: Apply)

TRANSATIONAL CONTROL LANGUAGE (T.C.L):

A transaction is a logical unit of work. All changes made to the database can be referred to as a transaction. Transaction changes can be mode permanent to the database only if they are committed a transaction begins with an executable SQL statement & ends explicitly with either role back or commit statement.

COMMIT:

This command is used to end a transaction only with the help of the commit command transaction changes can be made permanent to the database.

Syntax: SQL>COMMIT;

Example: SQL>COMMIT;

SAVE POINT: Save points are like marks to divide a very lengthy transaction to smaller once. They are used to identify a point in a transaction to which we can latter role back. Thus, save point is used in conjunction with role back.

Syntax: SQL>SAVE POINT ID;

Example: SQL>SAVE POINT xyz;

ROLL BACK:

A role back command is used to undo the current transactions. We can role back the entire transaction so that all changes made by SQL statements are undo (or) role back a transaction to a save point so that the SQL statements after the save point are role back.

Syntax:

ROLE BACK(current transaction can be role back)

ROLE BACK to save point ID;

Example:

SQL>ROLE BACK;

SQL>ROLE BACK TO SAVE POINT xyz;

SAVE POINT:

Save points are like marks to divide a very lengthy transaction to smaller once. They are used to identify a point in a transaction to which we can latter role back. Thus, save point is used in conjunction with role back.

Syntax:

SQL> SAVE POINT ID;

Example: SQL> SAVE POINT xyz;

Ex. No : 11

Practice of SQL DCL commands for granting and revoking user privileges

CO2: Construct queries using SQL for database creation, interaction, modification, and

updation. (Cognitive Knowledge Level: Apply)

PRIVILEGES

A privilege is a right to execute an SQL statement or to access another user's object. In Oracle, there are two types of privileges □

- System Privileges □
- Object Privileges □

System Privileges

are those through which the user can manage the performance of database actions. It is normally granted by DBA to users. Eg: Create Session,Create Table,Create user etc.. □

Object Privileges

allow access to objects or privileges on object, i.e. tables, table columns. tables,views etc..It includes alter,delete,insert,select update etc. (After creating the user, DBA grant specific system privileges to user)

GRANT

The DBA uses the GRANT statement to allocate system privileges to other user.

Syntax:

SQL> GRANT privilege [privilege…. …] TO USER ;

SQL> Grant succeeded

Eg: Grant create session, create table, create view to James;

Object privileges vary from object to object.

An owner has all privilege or specific privileges on object.

SQL> GRANT object_priv [(column)] ON object TO user;

SQL>GRANT select, insert ON emp TO James;

SQL>GRANT select ,update (e_name,e_address) ON emp TO James;

CHANGE PASSWORD:

The DBA creates an account and initializes a password for every user.You can change password by using ALTER USER statement.

Syntax:

Alter USER IDENTIFIED BY

Eg:

ALTER USER James IDENTIFIED BY sam

REVOKE

REVOKE statement is used to remove privileges granted to other users.The privileges you specify are revoked from the users.

Syntax:

REVOKE [privilege.. …] ON object FROM user

Eg: □

REVOKE create session,create table from James; □

REVOKE select ,insert ON emp FROM James

ROLE

A role is a named group of related privileges that can be granted to user.In other words, role is a predefined collection of previleges that are grouped together,thus privileges are easier to assign user.

SQL> Create role custom;

SQL> Grant create table, create view TO custom;

SQL> Grant select, insert ON emp TO custom;

Eg: Grant custom to James, Steve;

Ex. No : 12 a) VIEW

Practice of SQL commands for creation of views and assertions

CO2: Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

Aim

Create a table employee with the following fields and create a view which contains the name and salary > 10000 and update the view by changing employees salary to 10. Employee(Name, DA, HRA, TA, Salary)

```
create table employee(name varchar2(10),da number(10), hra number(10), ta number(10),salary number(10));

insert into employee values('&name',&da,&hra,&ta,&salary) ;

select * from employee;
```

NAME	DA	HRA	TA	SALARY
Anil	1000	2000	1000	15000
arun	1000	3000	1500	20000
anu	500	2000	500	9000
beena	900	2500	1000	11000
remya	1500	1000	2000	10000

```
create view emp as select emp_name,salary from employee where salary>10000;
```

EMP_NAME	SALARY
arun	20000
anil	15000
beena	11000

```
update emp set salary=10; 3 rows updated.

select * from employee;
```

NAME	DA	HRA	TA	SALARY
anil	1000	2000	1000	10
arun	1000	3000	1500	10
anu	500	2000	500	9000
beena	900	2500	1000	10

remya 1500 1000 2000 10000

Ex. No : 12 a) ASSERTION

Aim

Create an assertion for the above table to mandate the minimum salary to be at least 10000.

COMMAND

CREATE ASSERTION MinSal

CHECK((SELECT salary FROM employee)>=10000)

CYCLE 2

Ex. No : 13

C04: Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)

Implementation of various control structures like IF-THEN, IF-THEN-ELSE, IF-THEN ELSIF, CASE, WHILE using PL/SQL

Procedural Language/Structured Query Language (PL/SQL) is an extension of SQL.

Basic Syntax of PL/SQL

```
DECLARE
    /* Variables can be declared here */
BEGIN
    /* Executable statements can be written here */
EXCEPTION
    /* Error handlers can be written here. */
END;
```

As we want output of PL/SQL Program on screen, before Starting writing anything type (Only Once per session)

```
SET SERVEROUTPUT ON
```

CONDITIONAL CONTROL IN PL/SQL:

In PL/SQL, the if statement allows you to control the execution of a block of code. In PL/SQL you can use the IF – THEN – ELSIF – ELSE – END IF statements in code blocks that will allow you to write specific conditions under which a specific block of code will be executed

Ex :- PL/SQL to find addition of two numbers

```
DECLARE
A INTEGER := &A;
B INTEGER := &B;
C INTEGER;
BEGIN
C := A + B;
DBMS_OUTPUT.PUT_LINE ('THE SUM IS '||C);
END;
/
```

Decision making with IF statement :-

The general syntax for the using IF--ELSE statement is

```
IF (TEST_CONDITION) THEN
     SET OF STATEMENTS
ELSE
     SET OF STATEMENTS
END IF;
```

For Nested IF—ELSE Statement we can use IF--ELSIF—ELSE as follows

```
IF (TEST_CONDITION) THEN
     SET OF STATEMENTS
ELSIF (CONDITION)
     SET OF STATEMENTS
END IF;
```

Ex:- **Largest of three numbers.**

This program can be written in number of ways, here are the two different ways to write the program.

Using IFELSE

```
DECLARE
     A NUMBER := &A;
     B NUMBER := &B;
     C NUMBER := &C;
     BIG NUMBER;
BEGIN
     IF (A > B) THEN
          BIG := A;
     ELSE
          BIG := B;
     END IF;
     IF(BIG < C ) THEN
          DBMS_OUTPUT.PUT_LINE('BIGGEST OF A, B AND C IS ' ||
     C);
     ELSE
          DBMS_OUTPUT.PUT_LINE('BIGGEST OF A, B AND C IS ' ||
     BIG);
     END IF;
END; /
```

Using IF—ELSIF—ELSE

```
DECLARE
     A NUMBER := &A;
     B NUMBER := &B;
     C NUMBER := &C;
BEGIN
     IF (A > B AND A > C) THEN
          DBMS_OUTPUT.PUT_LINE('BIGGEST IS ' || A);
     ELSIF (B > C) THEN
          DBMS_OUTPUT.PUT_LINE('BIGGEST IS ' || B);
     ELSE
          DBMS_OUTPUT.PUT_LINE('BIGGEST IS ' || C);
     END IF;
END; /
```

CASE statement

```
CASE selector
   WHEN 'value1' THEN S1;
   WHEN 'value2' THEN S2;
   WHEN 'value3' THEN S3;
   ...
   ELSE Sn;  -- default case
END CASE;
```

Example

```
DECLARE
```

```
     grade char(1) := 'A';
BEGIN
     CASE grade
          when 'A' then dbms_output.put_line('Excellent');
          when 'B' then dbms_output.put_line('Very good');
          when 'C' then dbms_output.put_line('Well done');
          when 'D' then dbms_output.put_line('You passed');
          when 'F' then dbms_output.put_line('Better try
     again');
     else dbms_output.put_line('No such grade');
     END CASE;
END; /
```

Iterative Control

This is the ability to repeat or skip sections of a code block. A loop repeats a sequence of statements. You have to place the keyword loop before the first statement in the sequence of statements that you want repeated and the keywords end loop immediately after the last statement in the sequence. Once a loop begins to run, it will go on forever. Hence loops are always accompanied by a conditional statement that keeps control on the number of times the loop is executed.

You can build user defined exits from a loop, where required.

THE WHILE LOOP:

```
WHILE<condition>
     LOOP <action>
END LOOP;
```

WRITE A PL/SQL PROGRAM TO FINDS SUM OF DIGITS OF A GIVEN NUMBER.

```
DECLARE
     n     INTEGER;
```

```
    temp_sum INTEGER;
    r     INTEGER;
BEGIN
    n := 123456;
    temp_sum := 0;SSS
    WHILE n <> 0 LOOP
        r := MOD(n, 10);
        temp_sum := temp_sum + r;
        n := Trunc(n / 10);
    END LOOP;
    dbms_output.Put_line('sum of digits = '|| temp_sum);
END;
```

Write a PL/SQL program to grade the student according to the following rules Student(name,rollno,mark1,mark2,mark3)

TOTAL MARKS	**GRADE**
>=250	Distinction
180-250	First Class
120-179	Second Class
80-119	Third Class
<80	Fail

The result should be in the following Format

STUDENT NAME:
ROLL NO :
TOTAL MARKS :
GRADE :

Create table Stud(rollno int primary key,name char(10),mark1 float,mark2 float,mark3 float);
Insert into stud values(&rollno,'&name',&mark1,&mark2,&mark3);

ROLLNO	NAME	MARK1	MARK2	MARK3
1	aparna	80	90	78
2	amritha	90	92	81
3	binuja	23	18	20
4	cathy	49	50	50
5	danish	60	62	61
6	fayas	76	62	74

```
DECLARE
name Char(10);
no int;
TOTMARK NUMBER(5,2);
BEGIN
Select rollno,name,(mark1+mark2+mark3) into No,Name, TOTMARK from stud where
rollno=&no;
IF TOTMARK >=250 THEN
        DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
         DBMS_OUTPUT.PUT_LINE(‘ ROLL NO     :'||no);
         DBMS_OUTPUT.PUT_LINE(' STUDENT NAME :'|| name);
         DBMS_OUTPUT.PUT_LINE(' TOTAL MARK   :'|| TOTMARK);
         DBMS_OUTPUT.PUT_LINE(' GRADE       :DISTINCTION’);
        DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
ELSE IF TOTMARK <250 AND TOTMARK >=180 THEN
        DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
         DBMS_OUTPUT.PUT_LINE(‘ROLL NO      :'||no);
         DBMS_OUTPUT.PUT_LINE(' STUDENT NAME  :'|| name);
         DBMS_OUTPUT.PUT_LINE(' TOTAL MARK    :'|| TOTMARK);
         DBMS_OUTPUT.PUT_LINE(' GRADE        :First Class’);
         DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');

ELSE IF TOTMARK <=179 AND TOTMARK >=120 THEN
        DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
         DBMS_OUTPUT.PUT_LINE(‘ROLL NO     :'||no);
         DBMS_OUTPUT.PUT_LINE(' NAME       :'|| name);
         DBMS_OUTPUT.PUT_LINE(' TOTAL MARK  :'|| TOTMARK);
         DBMS_OUTPUT.PUT_LINE(' GRADE      :SECOND Class’);
         DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
```

```
ELSE

        DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
       DBMS_OUTPUT.PUT_LINE(‘ROLL NO     :'||no);
        DBMS_OUTPUT.PUT_LINE(' NAME       :'|| name);
        DBMS_OUTPUT.PUT_LINE(' TOTAL MARK :'|| TOTMARK);
       DBMS_OUTPUT.PUT_LINE('FAILED ');
       DBMS_OUTPUT.PUT_LINE ('-----------------------------------------------');
END IF;
END IF;
END IF;
END;
/
```

Ex. No : 14

Creation of Procedures, Triggers and Functions

C03: Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)

Trigger

A trigger is a procedure that is automatically invoked by the DBMS in response to specified changes to the database, and is typically specified by the DBA.. A database that has a set of associated triggers is called an Active Database.

A trigger description contains three parts:

Event : A change to the database that activates the trigger.

Condition : A query or test that is run when the trigger is activated.

Action : A procedure that is executed when the trigger is activated and its condition is true.

An insert, delete, or update statement could activate a trigger, regardless of which user or application invoked the activating statement; users may not even be aware that a trigger was executed as a side effect of their program.

Procedure in PL/SQL

Procedures are written for doing specific tasks. The general syntax of procedure is

CREATE OR REPLACE PROCEDURE (Par_Name1 [IN / OUT/ IN OUT] Par_Type1, ….)
IS (Or we can write AS)

Local declarations;

BEGIN

PL/SQL Executable statements;

..

..

..

EXCEPTION

Exception Handlers;

END<Pro Name> ;

Mode of parameters

1. IN Mode :- IN mode is used to pass a value to Procedure/Function. Inside the procedure/function, IN acts as a constant and any attempt to change its value causes compilation error.
2. OUT Mode : The OUT parameter is used to return value to the calling routine. Any attempt to refer to the value of this parameter results in null value.
3. IN OUT Mode : IN OUT parameter is used to pass a value to a subprogram and for getting the updated value from the subprogram.

Function

A standalone function is created using the CREATE FUNCTION statement. The simplified syntax for the CREATE OR REPLACE PROCEDURE statement is as follows −

```
CREATE [OR REPLACE] FUNCTION function_name

[(parameter_name [IN | OUT | IN OUT] type [, ...])]

RETURN return_datatype

{IS | AS}

BEGIN

   < function_body >

END [function_name];
```

Where,

- function-name specifies the name of the function.
- [OR REPLACE] option allows the modification of an existing function.
- The optional parameter list contains name, mode and types of the parameters. IN represents the value that will be passed from outside and OUT represents the parameter that will be used to return a value outside of the procedure.
- The function must contain a return statement.
- The RETURN clause specifies the data type you are going to return from the function.
- function-body contains the executable part.

- The AS keyword is used instead of the IS keyword for creating a standalone function.

Ex. No. 14 a) TRIGGER

Aim:

A Library database contain the following tables.

Book_avail (bookid, title, no_of _copies, price)
Student (st_id,name,class,fine)
Issue_tab (st_id, book_id, issuedate, returndate)

Create a database trigger to calculate the fine based on the rules given below.
After 1 month 5% of price
After 2 month 10% of price
After 3 month 20% of price.

INPUT

```
create or replace trigger t2
after update of returndate on issue
for each row
declare
pr int;
months int;
begin
select price into pr from book where bid=:old.bid;
months:=months_between(:new.returndate,:old.issuedate);
if months>=1 and months<2 then
update st set fine=pr*0.05 where stid=:old.stid;
else if months>=2 and months<3 then
update st set fine=pr*0.1 where stid=:old.stid;
else if months>=3 then
update st set fine=pr*0.2 where stid=:old.stid;
end if;
end if;
end if;
end;
/
```

PL/SQL

```
set serveroutput on;
declare
id st.stid%type;
dat issue.return%type;
begin
id:=&id;
dat:=&dat;
update issue set return=dat where stid=id;
end;
/
```

Ex. No. 14 b) PROCEDURE

Aim:

Create table **Employee(eno,ename,deptno,salary)**

1. Write a procedure to calculate the income tax paid as follows.
   a) If gross salary for a financial year is less than 1 lakh, he needs to pay no tax.
   b) If gross salary is between 1 lakh and 1.5 lakh, tax is calculated as 10% of amount exceeding 1 lakh
   c) If gross salary is between 1.5 lakh and 2 lakhs, 20% of the amount exceeding 1 lakh is taxable.

d) If gross salary is above 2 lakhs, 30% of the amount exceeding 1 lakh is taxable.

Store the details in a new table having fields eno, deptno, & tax_amount

PROCEDURE

```
create or replace procedure inctax(sal IN number,tax OUT number) is
a number(15);
begin
a:=sal*12;
if (a<=100000) then
tax:=0;
else if (a<=150000 and a>100000) then
tax:=((a-100000)*0.1);
else if (a<=200000 and a>150000) then
tax:=((a-100000)*0.2);
else if (a>200000) then
tax:=((a-100000)*0.3);
end if;
end if;
end if;
end if;
end;
/
```

PL/SQL

```
declare
t tax.tax_amount%type;
s em.salary%type;
no em.eno%type;
dno em.deptno%type;
begin
no:=&no;
select salary,deptno into s,dno from em where eno=no;
inctax(s,t);
insert into tax(eno,deptno,tax_amount)values(no,dno,t);
dbms_output.put_line('Emp No:'||no);
dbms_output.put_line('Dept No:'||dno);
dbms_output.put_line('Tax:'||t);
commit;
end;
/
```

```
SQL> select * from em;

       ENO ENAME                DEPTNO     SALARY
```

```
---------- -------------------- ---------- ----------
         1 cyril                101      12000
         2 jarish               102      10000
         3 amruth                 101      11000
         4 arun                 105       9000
         5 jeron                105       8500
         6 akhil                111        750
         8 faizal               106      20000
         9 able                 105      19000
        10 abhijith               103      17500

9 rows selected.

SQL> select * from tax;

       ENO     DEPTNO TAX_AMOUNT
---------- ---------- ----------
         1        101       4400
         2        102       2000
         1        101       4400
         2        102       2000
         1        101       4400
         2        102       2000

6 rows selected.


SQL> /
Enter value for no: 1
old   7: no:=&no;
new   7: no:=1;

PL/SQL procedure successfully completed.

Commit complete.
```

Ex. No. 14 c) FUNCTION

Aim:

Create the following table :
Item (item-code, item-name, qty-in-stock, reorder-level)
Supplier (supplier-code, supplier-name, address)
Can-Supply (supplier-code, item-code)
Write PL/SQL function to do the following:
Set the status of the supplier to "important" if the supplier can supply more than five items.

Program:

```
create or replace function stat(s IN int)
return int is
n int;
begin
select count(itemcode) into n from cansup where supplicode=s;
if n>=5 then
update suppli set status='important' where supplicode=s;
return(1);
else if n<5 then
return(0);
end if;
end if;
end;
```

PL/SQL

```
set serveroutput on;
declare
cursor c is
select supplicode,suppliname from suppli;
scode suppli.supplicode%type;
sname suppli.suppliname%type;
flag int;
begin
open c;
loop
fetch c into scode,sname;
exit when c%notfound;
flag:=stat(scode);
if flag=1 then
dbms_output.put_line('supplier  '||sname||'  with  '||scode||'   is important');
end if;
end loop;
close c;
commit;
```

```
end;
```

Ex. No. 15

Creation of Packages

C04 : Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)

AIM

Create a PL/SQL Package with addition and subtraction

```
Create or replace package body OPERATION
is
        PROCEDURE ADDITION(A IN NUMBER,B IN NUMBER)
        is
                begin
                        dbms_output.put_line('addtion of two number :'||ADD(A,B));
                end;
        FUNCTION SUB(A IN NUMBER,B IN NUMBER)RETURN NUMBER
         is
                ans number(3);
                begin
                         ans:=A-B;
                        return ans;
                end;
end OPERATION;
/
```

Output

```
SQL>start D://pacbody.sql
Package body created.
```

Ex. No : 16

Creation of Cursors

C03 : Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)

Aim

Creation of Cursors

1) To write a Cursor to display the list of 10 highest paid Employees and their Total Salary

INPUT

```
set serveroutput on;
declare
cursor c is
select empid,empname,salary from emplo order by salary desc;
name emplo.empname%type;
id emplo.empid%type;
sal emplo.salary%type;
tot emplo.salary%type;
i int;
begin
tot:=0;
open c;
for i in 1..10
loop
fetch c into id,name,sal;
exit when c%NOTFOUND;
tot:=tot+sal;
dbms_output.put_line('EMPLOYEE ID:'||id);
dbms_output.put_line('EMPLOYEE NAME:'||name);
dbms_output.put_line('SALARY:'||sal);
dbms_output.put_line('**********************');
end loop;
dbms_output.put_line('TOTAL SALARY:'||tot);
commit;
close c;
end;
/
```

Ex. No : 17

C04 : Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)

Aim

Creation of PL/SQL blocks for exception handling

Write a PL/SQL block to handle the following BUILT-IN EXCEPTIONS.

```
DECLARE
        M NUMBER(4);
        MYERROR EXCEPTION;
BEGIN
        SELECT COMM INTO M FROM EMP WHERE EMPNO=7839;
        IF M IS NULL THEN
                RAISE MYERROR;
        END IF;
        EXCEPTION
                WHEN NO_DATA_FOUND THEN
                        DBMS_OUTPUT.PUT_LINE('ERROR OF DATA');
                WHEN TOO_MANY_ROWS THEN
                        DBMS_OUTPUT.PUT_LINE('ERROR OF TOO MANY ROWS');
                WHEN MYERROR THEN
                        DBMS_OUTPUT.PUT_LINE('ERROR FOUND NULL');
END;
/
```

Ex. No. 18

Familiarization of NoSQL Databases and CRUD operations

CO5: Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)

Aim

Familiarization of NoSQL Databases and CRUD operations

Introduction

CRUD is an acronym for CREATE, READ, UPDATE & DELETE, which are rudimentary operations in the database.

In this post, I have used MongoDB as my primary database, which is a NoSQL database, unlike the traditional row/column model, it saves the data aka document in a JSON format, and performed the CRUD operations using the Node.js language.

Fundamentally Node.js works asynchronous or non-blocking by default so that it doesn't wait in the cases where CPU is used intensively by a code.

Thus designing CRUD operations as synchronous or asynchronous based on our case is a challenging process, particularly when we used it in a real-time server operation, in the following sections I have performed those operations in both sync/async ways.

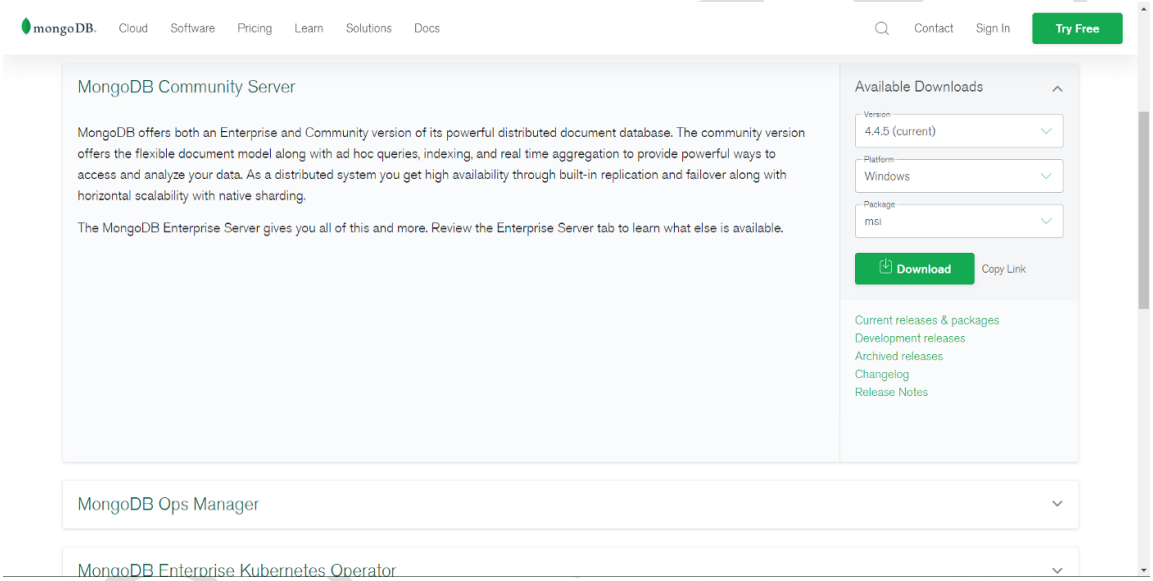
In this post, I have created and used a movie database throughout, which contains the details related to a specific movie, so that you can manipulate it based on your use case.

2. Setting up MongoDB (NoSQL)

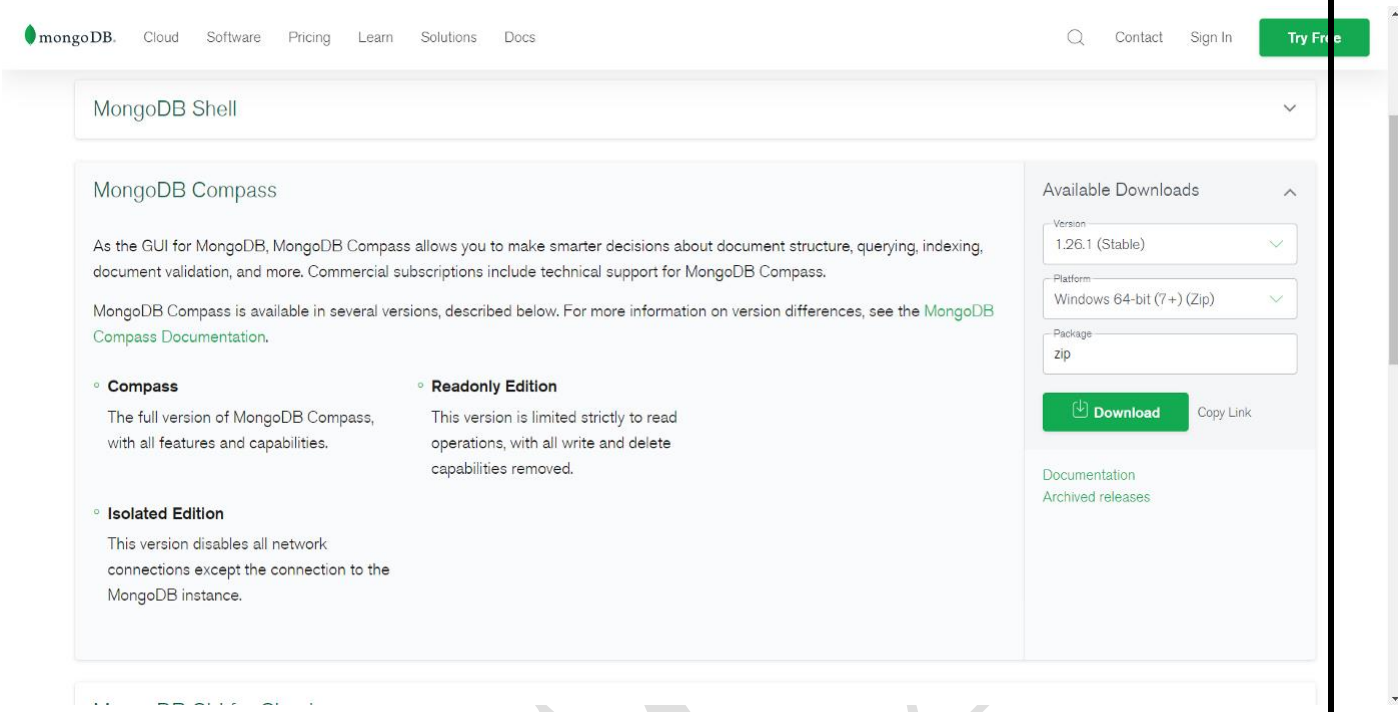
MongoDB is a document database, which means it stores data in JSON-like documents. We believe this is the most natural way to think about data and is much more expressive and powerful than the traditional row/column model.

We need two components to set up the MongoDB browser.

1. MongoDB Community Server
2. MongoDB Compass (GUI Viewer)



MongoDB Community Server



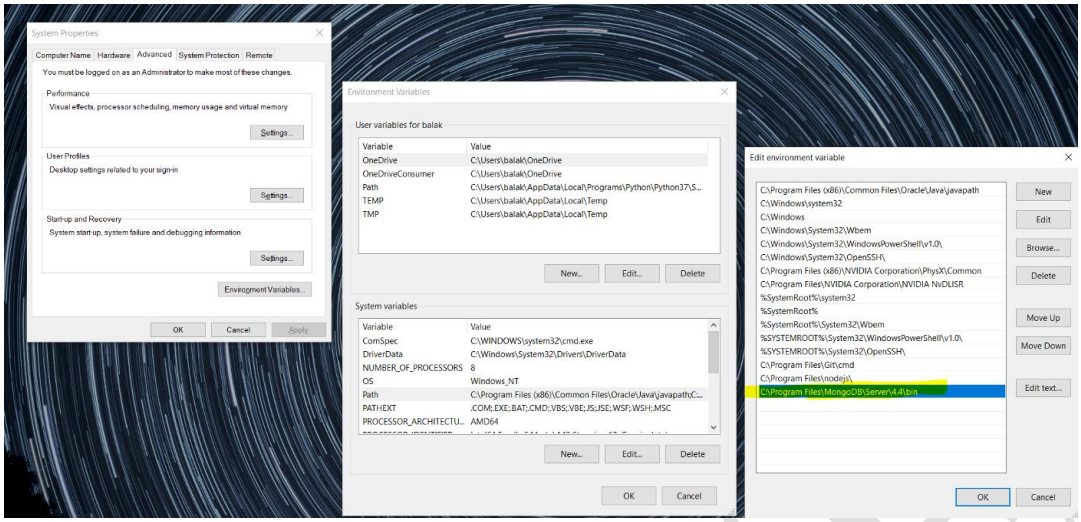
MongoDB Compass (GUI Viewer for MongoDB)

After installing both the applications, we need to add the MongoDB server path to our environment variables in your PC.

So navigate yourself in the C directory of your PC and find the location of the mongod.exe file and copy the address path.

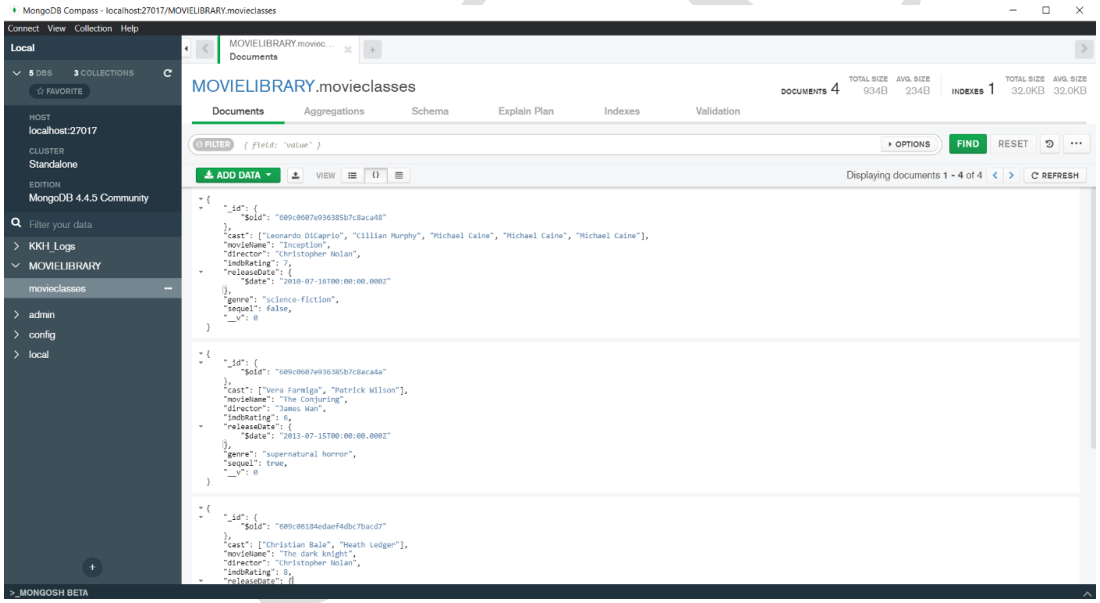
In my case, I found the address to be: **C:\Program Files\MongoDB\Server\4.4\bin**

Add the above location to environment variables like the below.



Now we are ready to create documents in our MongoDB database.

Also, we can view the database in MongoDB Compass, after creating the first document.



MongoDB Compass document view. Source — Author

3. Synchronous Vs Asynchronous Execution

In NodeJS we can perform database CRUD operations in both synchronous (blocking) and asynchronous (non-blocking) ways.

Sometimes while doing CRUD operations, we might need the variable to send via API or use it in the subsequent codes, etc., In that case, we use synchronous programming, where a line in the code waits for the previous line to finish before its execution.

This is a time-consuming process, so alternatively we can do the operations asynchronously. This is purely based on the use case that we are working on.

Here I will demonstrate both ways to perform the same CRUD operations.

4. Creating a Schema, Model, Object

Schema is like a blueprint which specifies, what to store on the database and in which format.

For taking this post in a more comfortable way, as I said previously I will be creating a movie database that contains the movie properties such as,

1. Movie name — (String),
2. Director — (String)
3. IMDB rating — (Number)
4. Cast — (Array)
5. Release date — (Datetime)
6. Genre — (String)
7. Sequel — (Boolean)

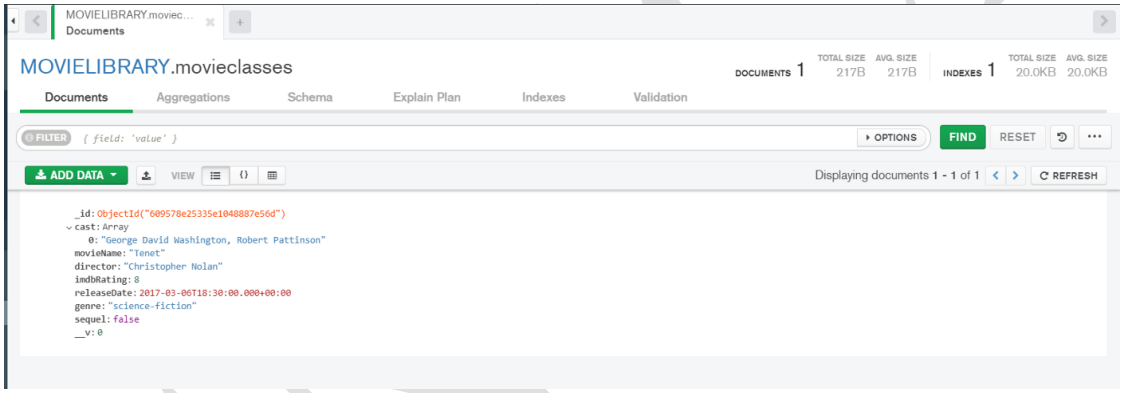
The primary reason for storing the above elements is to incorporate all kind of data structures like String, Boolean, Number, Array, DateTime, etc.,

So in the code snippet above, I have created the movieSchema which contains the blueprint of the document.

And later I create a constant movieClass which is a model, created based on the schema.

Using the model, we can create an instance aka object which is used for a new entry in the document. It is very similar to the OOPS concept of class and objects.

And as you can see, I have created a new object called ‘tenet’ to resemble the film name, populated the fields, and later saved it. Now if we check the GUI database viewer — MongoDB Compass, we must see the new document created.



Now let’s proceed further for CRUD operations in both synchronous and asynchronous ways.

5. CREATE (Synchronous)

We have already created a new document named after ‘tenet’ previously. So now we create a function that can be used to create many movie listings hereafter.

After the function insertMovie is declared, we can do a function call with its input parameters, which needs to be updated in the database. Once they’re inserted, we will get the document that is inserted.

```
const movieClass = require('./movieSchema')

// // CREATE

// Function Declaration

async function insertMovie(name_, director_, rating_, cast_, date_, genre_, sequel_){

const movieObject = new movieClass({

movieName : name_,

director: director_,

imdbRating: rating_,

cast: cast_,

releaseDate: date_,

genre: genre_,

sequel: sequel_

});

result = await movieObject.save()

return result

}


// Function Call

let output_1 = insertMovie('Inception', 'Christopher Nolan', 7, ['Leonardo DiCaprio',
'Cillian Murphy'], new Date('2010-07-16'),

'science-fiction', false)

output_1.then(function(response) {

console.log(response, 'output response')

})
```

```
// Function Call

let output_2 = insertMovie('Tenet', 'Christopher Nolan', 7, ['George David Washington',
'Robert Pattinson'], new Date('2020-12-04'),

'science-fiction', false)

output_2.then(function(response) {

console.log(response, 'output response')

})


// Function Call

let output_3 = insertMovie('The Conjuring', 'James Wan', 6, ['Vera Farmiga', 'Patrick
Wilson'], new Date('2013-07-15'),

'supernatural horror', true)

output_3.then(function(response) {

console.log(response, 'output response')

})
```

Here we have inserted 3 movies.

6. CREATE (Asynchronous)

Similarly, we can insert new documents in the Mongo DB, without waiting or otherwise no code blocking.

```
const movieClass = require('./movieSchema')

// // CREATE

var theDarkKnight = new movieClass({movieName : "The dark knight",

director: "Christopher Nolan",
```

```
imdbRating: 8,
cast: ["Christian Bale", "Heath Ledger"],
releaseDate: new Date('2008-01-14'),
genre: "superhero",
sequel: true})

console.log('DB Updated');
theDarkKnight.save()

var djangoUnchained = new movieClass({movieName : "Django Unchained",
director: "Quentin Tarantino",
imdbRating: 8,
cast: ["Christoph Waltz", "Jamie Foxx"],
releaseDate: new Date('2012-12-12'),
genre: "revisionist Western",
sequel: false})

console.log('DB Updated');
djangoUnchained.save()

var theNun = new movieClass({movieName : "The Nun",
director: "Corin Hardy",
imdbRating: 6,
cast: ["Taissa Farmiga", "Demián Bichir"],
```

```
releaseDate: new Date('2018-09-04'),
genre: "supernatural horror",
sequel: false})

console.log('DB Updated');
theNun.save()
```

Also, I have added another 3 movie sets in no code blocking way.