Diploma Engineering

Laboratory Manual

(Database Management System)
(DI04032011)

[ICT Engineering, Semester IV]

Enrolment No	
Name	
Branch	
Academic Term	
Institute	

Directorate of Technical Education
Gandhinagar - Gujarat

DTE's Vision:

- □ To provide globally competitive technical education;
- □ Remove geographical imbalances and inconsistencies;
- □ Develop student friendly resources with a special focus on girls' education and support to weaker sections;
- □ Develop programs relevant to industry and create a vibrant pool of technical professionals.

Institute's Vision:

Institute's Mission:

Department's Vision:

Department's Mission:

Certificate

This is to certify that Mr./Ms ……………………………………………….Enrollment No………………………………… of 4TH Semester of Information and Communication technology of ___________________________________ has satisfactorily completed the term work in course Database Management System (DI04032011) for the academic year: ______________________ Term: Odd/Even prescribed in the GTU curriculum.

Place:…………………..

Date: …………………..

Signature of Course Faculty **Head of the Department**

Preface

The primary aim of any laboratory/Practical/field work is enhancement of required skills as well as creative ability amongst students to solve real time problems by developing relevant competencies in psychomotor domain. Keeping in view, GTU has designed competency focused outcome-based curriculum -2021 (COGC-2021) for Diploma engineering programmes. In this more time is allotted to practical work than theory. It shows importance of enhancement of skills amongst students and it pays attention to utilize every second of time allotted for practical amongst Students, Instructors and Lecturers to achieve relevant outcomes by performing rather than writing practice in study type. It is essential for effective implementation of competency focused outcome- based Green curriculum-2021. Every practical has been keenly designed to serve as a tool to develop & enhance relevant industry needed competency in each and every student. These psychomotor skills are very difficult to develop through traditional chalk and board content delivery method in the classroom. Accordingly, this lab manual has been designed to focus on the industry defined relevant outcomes, rather than old practice of conducting practical to prove concept and theory.

By using this lab manual, students can read procedure one day in advance to actual performance day of practical experiment which generates interest and also, they can have idea of judgement of magnitude prior to performance. This in turn enhances predetermined outcomes amongst students. Each and every Experiment /Practical in this manual begins by competency, industry relevant skills, course outcomes as well as practical outcomes which serve as a key role for doing the practical. The students will also have a clear idea of safety and necessary precautions to be taken while performing experiment.

This manual also provides guidelines to lecturers to facilitate student-centered lab activities for each practical/experiment by arranging and managing necessary resources in order that the students follow the procedures with required safety and necessary precautions to achieve outcomes. It also gives an idea that how students will be assessed by providing Rubrics.

Internet is widely used in different areas such as banking, e-commerce, education and many others. Different technologies are used to develop web applications but HTML is the core component in all types of applications for formatting and presenting the web content. This course will impart skill sets related to designing HTML web pages, using cascading style sheets and embedding Java script using Kompozer. This course will also serve as a pre-requisite for the advanced web development technologies, which students will learn in the upcoming semester.

Programme Outcomes (POs) :

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the *engineering* problems.

2. **Problem analysis**: Identify and analyse well-defined *engineering* problems using codifiedstandard methods.

3. **Design/ development of solutions:** Design solutions for *engineering* well-defined technicalproblems and assist with the design of systems components or processes to meet specified needs.

4. **Engineering Tools, Experimentation and Testing:** Apply modern *engineering* tools andappropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-definedengineering activities.

7. **Life-long learning:** Ability to analyze individual needs and engage in updating in the contextof technological changes *in field of engineering.*

Practical Outcome - Course Outcome matrix

Course Outcomes (COs):

CO1: Understand the fundamental concepts of database systems and role of databases in sustainable development and identify eco-friendly practices in database systems
CO2: Design database using Entity Relationship approach
CO3: Manage and Implement database using SQL
CO4: Apply concepts of normalization to design an optimal database.
CO5: Explain transaction management concepts for concurrent use of database.

S. No.	Practical Outcome/Title of experiment	CO 1	CO 2	CO 3	CO 4	CO 5
1.	Basics of Database, its applications and Data Models a. Prepare a report on Current Database Trends. b. Prepare a list of most famous websites and Mobile Applications with Database Tools used in it.	√				
2.	Prepare ER diagram for Library Management System and convert it to relational schema		√			
3.	Implement SQL queries to perform various DDL Commands.		-	√	-	
4.	a. Implement SQL queries to perform various DML Commands. b. Retrieve data using SELECT command and various SQL operators.		-	√	-	
5.	Implement SQL queries using Date functions like add-months, months-between, round, nextday, truncate etc.		-	√	-	
6.	Implement SQL queries using Numeric functions like abs, ceil, power, mod, round, trunc, sqrt etc. and Character Functions like initcap, lower, upper, ltrim, rtrim, replace, substring, instr etc.		-	√	-	
7.	Implement SQL queries using Conversion Functions like to- char, to-date, to-number and Group functions like Avg, Min, Max, Sum, Count, Decode etc.	-		√	-	
8.	Implement SQL queries using Set operators like Union, union all, Intersect, Minus etc.	-		√	-	

9.	Retrieve data spread across various tables or same table using various Joins.			√		
10.	Perform queries to Create, alter and update views	-	-	√	-	
11.	Implement SQL queries for CREATE USER, GRANT,REVOKE and DROP USER command.	-	-	√	-	-
12.	Implement Practical-1 again with Domain Integrity, Entity Integrity and Referential Integrity constraints.	-	-	√	-	-
13.	Perform Various Normalization forms on any database.	-	-	-	√	-
14.	Perform SQL queries for TCL(Transaction Control Language) and DCL(Data Control Laguage) Commands.	-	-	-	-	√

Guidelines to Course Faculty

1. Couse faculty should demonstrate experiment with all necessary implementation strategies described in curriculum.
2. Couse faculty should explain industrial relevance before starting of each experiment.
3. Course faculty should involve & give opportunity to all students for hands on experience.
4. Course faculty should ensure mentioned skills are developed in the students by asking.
5. Utilise 2 hrs of lab hours effectively and ensure completion of write up with quiz also.
6. Encourage peer to peer learning by doing same experiment through fast learners.

Instructions for Students

1. Organize the work in the group and make record of all observations.
2. Students shall develop maintenance skill as expected by industries.
3. Student shall attempt to develop related hand-on skills and build confidence.
4. Student shall develop the habits of evolving more ideas, innovations, skills etc.
5. Student shall refer technical magazines and data books.
6. Student should develop habit to submit the practical on date and time.
7. Student should well prepare while submitting write-up of exercise.

Continuous Assessment Sheet

Enrolment No: **Name**

Term:

Sr no	Practical Outcome/Title of experiment	Page	Date	Marks (10)	Sign
1.	Basics of Database, its applications and Data Models a. Prepare a report on Current Database Trends. b. Prepare a list of most famous websites and Mobile Applications with Database Tools used in it.				
2.	Prepare ER diagram for Library Management System and convert it relational schema				
3.	Implement SQL queries to perform various DDL Commands.				
4.	a. Implement SQL queries to perform various DML Commands. b. Retrieve data using SELECT command and various SQL operators.				
5.	Implement SQL queries using Date functions like add-months, months-between, round, nextday, truncate etc.				
6.	Implement SQL queries using Numeric functions like abs, ceil, power, mod, round, trunc, sqrt etc. and Character Functions like initcap, lower, upper, ltrim, rtrim, replace, substring, instr etc.				
7.	Implement SQL queries using Conversion Functions like to- char, to-date, to-number and Group functions like Avg, Min, Max, Sum, Count, Decode etc.				
8.	Implement SQL queries using Set operators like Union, union all, Intersect, Minus etc.				
9.	Retrieve data spread across various tables or same table using various Joins.				
10.	Perform queries to Create, alter and update views				
11.	Implement SQL queries for CREATE USER, GRANT,REVOKE and DROP USER command.				

12.	Implement Practical-3 again with Domain Integrity, Entity Integrity and Referential Integrity constraints.				
13.	Perform Various Normalization forms on any database.				
14.	Perform SQL queries for TCL(Transaction Control Language) and DCL(Data Control Laguage) Commands.				

Total		

Date: ___________________

Practical No.1: Basics of Database, its applications and Data Models

a. Prepare a report on Current Database Trends.
b. Prepare a list of most famous websites and Mobile Applications with Database Tools used in it.

A. Objective:

DBMS helps to understand how data is stored, organized, and accessed in computer systems, and its applications in managing large amounts of information efficiently through the use of data models.

B. Expected Program Outcomes (POs)

Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

C. Expected Skills to be developed based on competency:

"Design database for a given application"
This practical is expected to develop the following skills.

1. Development of research and technical skills about database.
2. Understanding the technical aspects of database systems.

D. Expected Course Outcomes(Cos)

CO1:- Understand the fundamental concepts of database systems and role of databases in sustainable development and identify eco-friendly practices in database systems

E. Practical Outcome(PRo)

Students will be able understand recent database trends and tools.

F. Expected Affective domain Outcome(ADos)

1. Follow safety practices.
2. Increased appreciation and enthusiasm for the importance of databases in modern technology and business.
3. Follow ethical practices.

G. Prerequisite Theory:

What is Data?

Data refers to the raw facts and figures that are collected and stored for future use. It can be in any form text,

What is Information?

Information is the meaningful interpretation of data. It is the output that is obtained after processing the data to extract meaning from it.

What is DBMS?

DBMS stands for Database Management System. It is a software system that allows users to create, maintain, and manage databases.

What is Metadata?

Metadata refers to the data that describes other data. It provides information about the structure, content, and context of data.

What are Data Items?

Data items are the smallest unit of information in a database. They represent a single fact or piece of information.

What are Fields?

Fields are the columns or attributes of a table in a database. They represent the different types of information that can be stored in a table.

What are Records?

Records are the rows or instances of a table in a database. They represent a collection of related data items.

What is a Data Dictionary?

A data dictionary is a centralized repository that stores metadata about the data elements and data structures in a database. It provides information about the data types, relationships, constraints, and other properties of the database.

What is a Schema in DBMS?

A schema is a logical structure that defines how data is organized and stored in a database. It includes the description of tables, attributes, relationships, and constraints.

What is a Sub-schema?

A sub-schema is a subset of the schema that describes the part of the database that is relevant to a particular user or group of users. It provides a view of the database that is tailored to the needs of the user.

What is an Instance in DBMS?

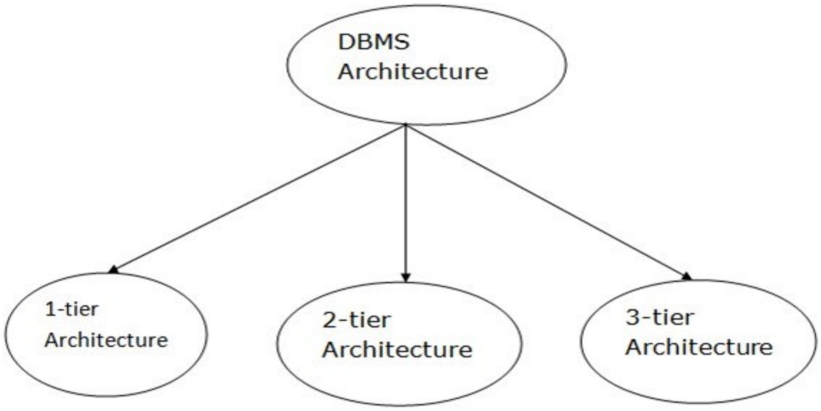
An instance is a snapshot of the data stored in a database at a particular point in time. It includes all the data values for the tables and records in the database. An instance is also referred to as a database state or database snapshot.

DBMS Architecture

The DBMS design depends upon its architecture. The basic client/server architecture is used to deal with a large number of PCs, web servers, database servers and other components that are connected with networks.

The client/server architecture consists of many PCs and a workstation which are connected via the network. DBMS architecture depends upon how users are connected to the database to get their request done.

- Types of DBMS Architecture



Database architecture can be seen as a single tier or multi-tier. But logically, database architecture is of two types like: 2-tier architecture and 3-tier architecture.

- 1-Tier Architecture

In this architecture, the database is directly available to the user. It means the user can directly sit on the DBMS and uses it. Any changes done here will directly be done on the database itself. It doesn't provide a handytool for end users. The 1-Tier architecture is used for development of the local application, where programmers can directly communicate with the database for the quick response.

- 2-Tier Architecture

The 2-Tier architecture is same as basic client-server. In the two-tier architecture, applications on the client end can directly communicate with the database at the server side. The user interfaces and application programs are run on the client-side. The server side is responsible to provide the functionalities like: query processing and transaction management. To communicate with the DBMS, client-side application establishes a connection with the server side.

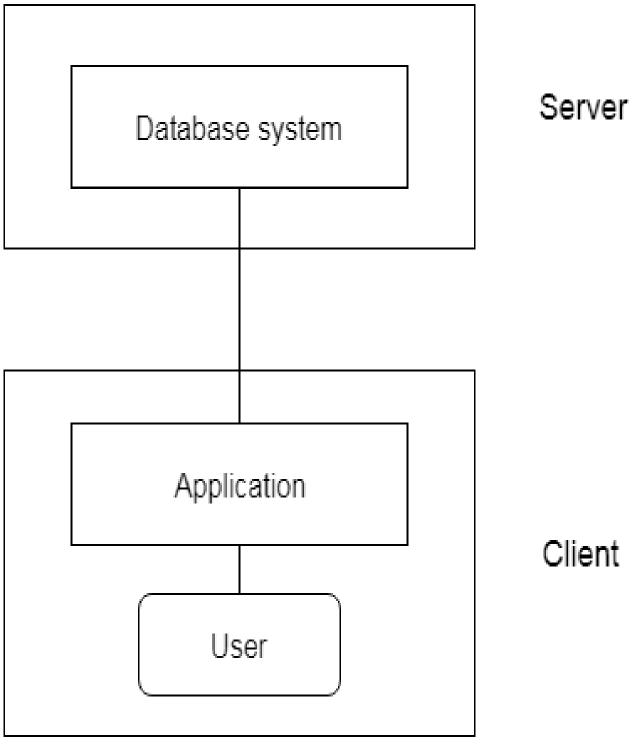


Fig: 2-tier Architecture

- 3-Tier Architecture

The 3-Tier architecture contains another layer between the client and server. In this architecture, client can't directly communicate with the server. The application on the client-end interacts with an application server which further communicates with the database system. End user has no idea about the existence of the database beyond the application server. The database also has no idea about any other user beyond the application. The 3-Tier architecture is used in case of large web application.

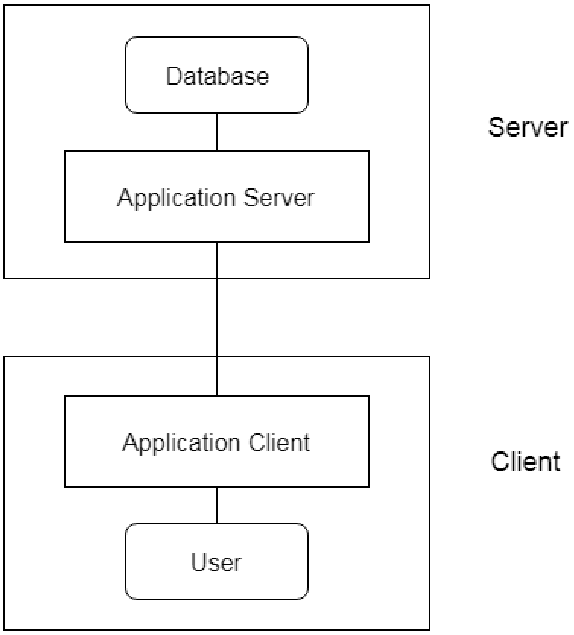


Fig: 3-tier Architecture

H. Resources/Equipment Required

Sr. No.	Instrument/Equipment/ Components/Trainer kit	Specification	Quantity
1	Hardware: Computer System	Computer (i3-i5 preferable), RAM minimum 2 GB and onwards	*As Per Batch Size*
2	Operating System	Windows/ Linux	
3	Software	Oracle	
4	Text Editor	Notepad, Notepad++, Sublime Text or similar	

I. Safety and necessary Precautions followed

NA

J. Report:

a. Prepare a report on Current Database Trends.

b. Famous Websites and Mobile Applications with Database Tools Used

K. Practical related Quiz.

1) DBMS stands for ________________________

2) What is Meta Data?

3) What is schema?

4) A schema is a **logical structure** that defines how the data is organized in a database, including tables, fields, relationships, and constraints

5) In **single-tier architecture** tier, the database is directly available to the user.

L. References / Suggestions

1. https://www.w3schools.com/sql/default.asp
2. https://www.tutorialspoint.com/dbms/
3. https://www.geeksforgeeks.org/dbms/

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Practical No.2:

Design an E-R diagram for a library management system and convert it to relational schema

Objective:

- E-R diagrams provide a high-level view of the database's purpose and requirements, ER diagrams provide a detailed view of the database's structure and relationships. Both are essential tools in database design and development
- To reduce data redundancy, minimize the possibility of data inconsistencies, and improve the performance of the database. By following the principles of normalization, you can create a database that is more organized, efficient, and easier to maintain over time.

A. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

B. Expected Skills to be developed based on competency:

- E-R diagramming skills can improve data modeling, problem-solving, communication, analytical, and technical skills, all of which are essential in the field of database design and management
- Ability to analyze data and identify relationships between different data points.
- Understanding of normalization rules and techniques for organizing data in a database.

- Proficiency in designing and implementing a normalized database schema to ensure data consistency and eliminate redundancies.

C. Expected Course Outcomes(Cos)

Apply various Normalization techniques

D. Practical Outcome(PRo)

- E-R diagram used in data modeling, database design, communication, maintenance, and optimization.
- Normalization can improve the efficiency, consistency, flexibility, and maintenance of a database.

E. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

F. **Prerequisite Theory:**

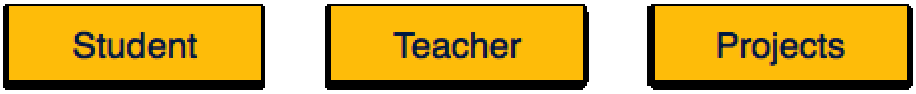
- The Entity Relational Model is a model for identifying entities to be represented in the database and representation of how those entities are related. The ER data model specifies enterprise schema that represents the overall logical structure of a database graphically.

- The Entity Relationship Diagram explains the relationship among the entities present in the database. ER models are used to model real-world objects like a person, a car, or a company and the relation between these real-world objects. In short, ER Diagram is the structural format of the database.

ER Model is used to model the logical view of the system from a data perspective which consists of these symbols:

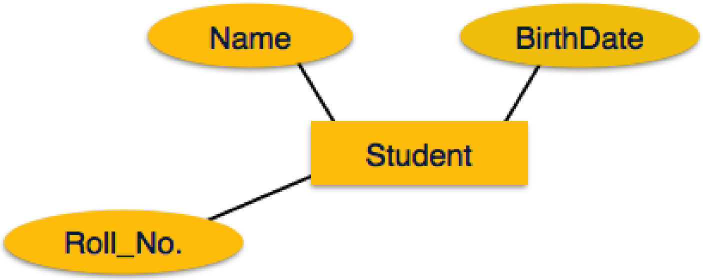
Entity

Entities are represented by means of rectangles. Rectangles are named with the entity set they represent.

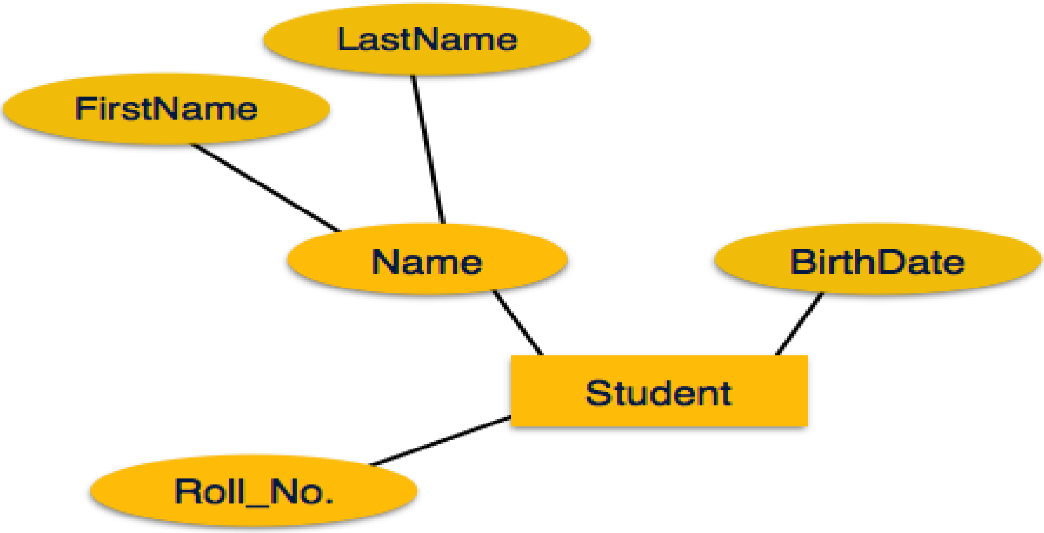


Attributes

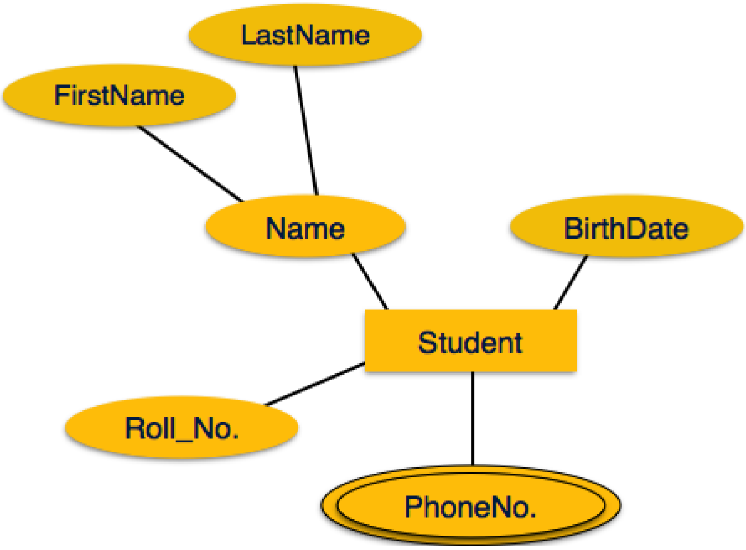
Attributes are the properties of entities. Attributes are represented by means of ellipses. Every ellipse represents one attribute and is directly connected to its entity (rectangle).



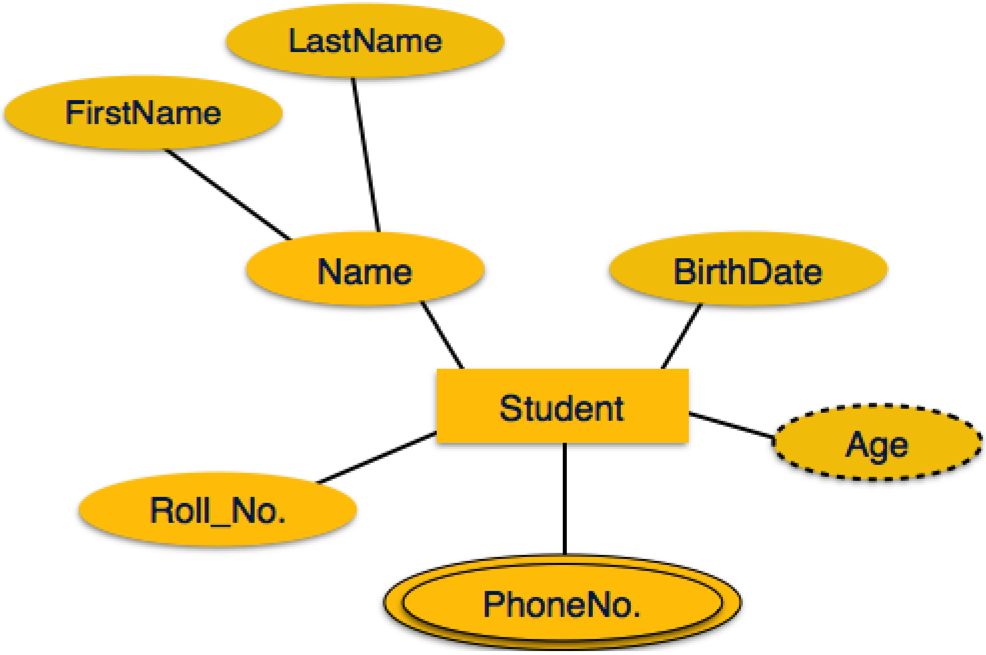
If the attributes are **composite**, they are further divided in a tree like structure. Every node is then connected to its attribute. That is, composite attributes are represented by ellipses that are connected with an ellipse.



Multivalued attributes are depicted by double ellipse.



Derived attributes are depicted by dashed ellipse.



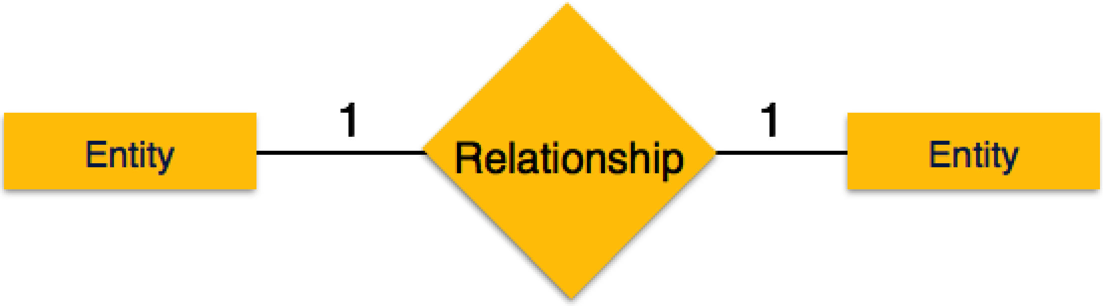
Relationship

Relationships are represented by diamond-shaped box. Name of the relationship is written inside the diamond-box. All the entities (rectangles) participating in a relationship, are connected to it by a line.

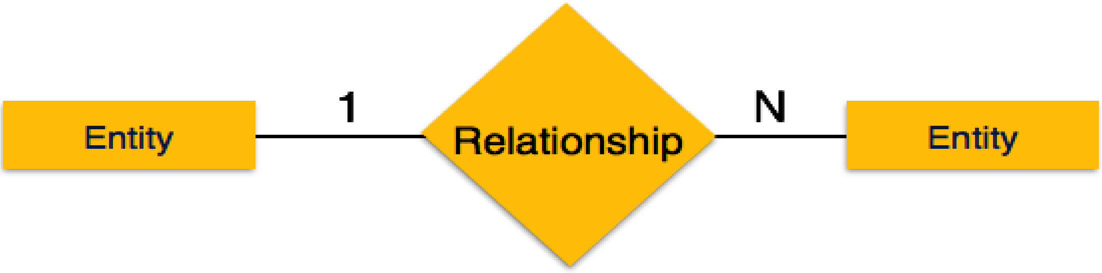
Binary Relationship and Cardinality

A relationship where two entities are participating is called a **binary relationship**. Cardinality is the number of instance of an entity from a relation that can be associated with the relation.

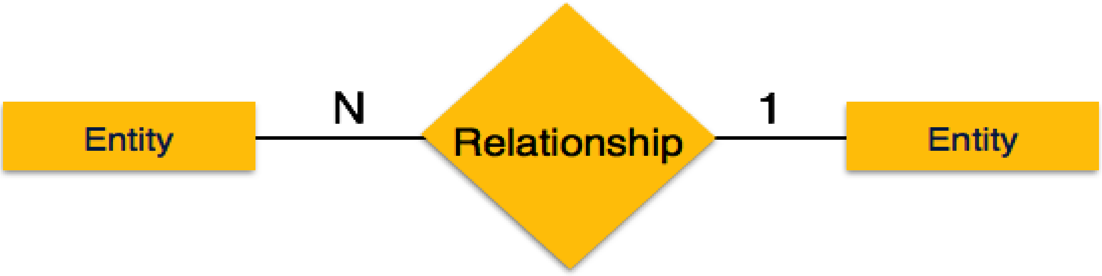
- **One-to-one** – When only one instance of an entity is associated with the relationship, it is marked as '1:1'. The following image reflects that only one instance of each entity should be associated with the relationship. It depicts one-to-one relationship.



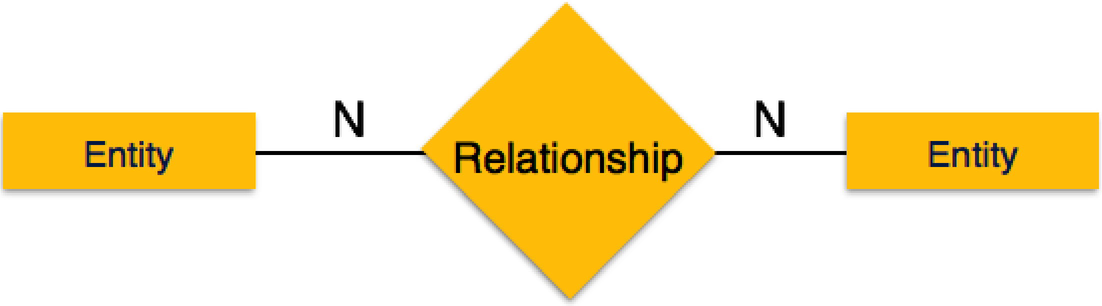
- **One-to-many** – When more than one instance of an entity is associated with a relationship, it is marked as '1:N'. The following image reflects that only one instance of entity on the left and more than one instance of an entity on the right can be associated with the relationship. It depicts one-to-many relationship.



- **Many-to-one** − When more than one instance of entity is associated with the relationship, it is marked as 'N:1'. The following image reflects that more than one instance of an entity on the left and only one instance of an entity on the right can be associated with the relationship. It depicts many-to-one relationship.

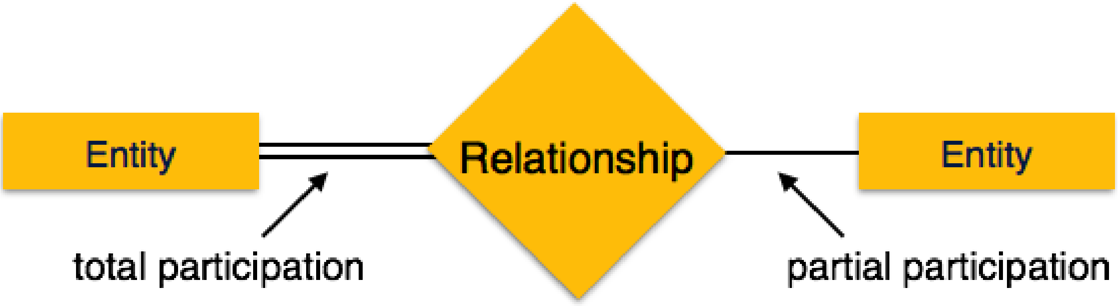


- **Many-to-many** − The following image reflects that more than one instance of an entity on the left and more than one instance of an entity on the right can be associated with the relationship. It depicts many-to-many relationship.



Participation Constraints

- **Total Participation** − Each entity is involved in the relationship. Total participation is represented by double lines.
- **Partial participation** − Not all entities are involved in the relationship. Partial participation is represented by single lines.



Questions:-

1. **Draw ER Diagram of Library Management system. Write relational schema of it**
2. **Draw ER diagram of College Management system. Write relational schema of it**

N. References / Suggestions

1. https://www.w3schools.com/sql/default.asp
2. https://www.tutorialspoint.com/dbms/
3. https://www.geeksforgeeks.org/dbms/

O. Assessment-Rubrics

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Sign with Date

Date: ……………

Practical No.3:

Implement SQL queries to perform various DDL(Data Definition Language) Commands. (Create minimum 5 tables as per given definition with different data types and operate upon them).

1. Create a table named "users" with the following columns/ attributes:

id (integer, primary key),name (varchar(50)),email (varchar(100))

password (varchar(100))

2. Create a table named "products" with the following columns:

id (integer, primary key),name (varchar(100)),price (decimal(10,2))

description (text)

3. Create a table named "orders" with the following columns:

id (integer, primary key),user_id (integer, foreign key references users(id)),product_id (integer, foreign key references products(id))

quantity (integer)

4. Create a table named " Students " with the following columns/ attributes:

student_id (integer, primary key), name (varchar(50)), age (integer), gender (varchar(10)), address (varchar(100))

5. Create a table named " Courses " with the following columns/ attributes:

course_id (integer, primary key), name (varchar(50)), credits (integer), instructor (varchar(50))

6. Create a table named " Enrollments " with the following columns/ attributes:

enrollment_id (integer, primary key), student_id (integer, foreign key to Students), course_id (integer, foreign key to Courses), semester (varchar(20)), year (integer)

7. Create a table named " Grades " with the following columns/ attributes: grade_id (integer, primary key), enrollment_id (integer, foreign key to Enrollments), grade (varchar(2))

A. Objective:

To perform various Data Definition Language (DDL) commands is to manage the structure of databases, tables, and indexes within a database management system (DBMS) using SQL commands

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering

well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL queries related to DDL statements

D. Expected Course Outcomes(Cos)

Perform queries on datasets using SQL*Plus

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using oracle software

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. Prerequisite Theory:

❖ **SQL DATA TYPES:-**

- CHAR (size)
- VARCHAR (size)/VARCHAR2 (size)
- DATE
- NUMBER (P, S)
- LONG
- RAW/LONGRAW

➢ **CHAR (SIZE)**

- This data type is used to store alphanumeric data of fixed length.
- The size represents length of character to be stored.
- This data type can store maximum 2000 characters.
- This is faster to access but requires more storage.

➢ **VARCHAR (size)/VARCHAR2 (size)**

- This data type is used to store variable length alphanumeric data.
- The maximum size of this data type is 4000 characters.
- This is slower to access in comparison to CHAR but is efficient for storage.

➢ **DATE**

- This data type is used to store date and time.
- The standard format is DD-MON-YY for example 21-JUN-09.
- Date time stores time in the 24-hours format.
- Range of this data type is January 1, 4712 B.C. to December 31, 4712A.D.

➢ **NUMBER (P,S)**

- The NUMBER data type is used store numbers (both Integer and floating-point numbers).
- We can store number up to 38 characters long.
- The precision (P), determines the maximum length of number, and scale (s), determines the decimal point sign(.) on the right of a number (P).

➢ **LONG**

- This data type is used to store variable length character strings upto 2GB.
- LONG data can be used to store binary data in ASCII format.

➢ **RAW/LONG RAW**

- The RAW/LONG RAW data type is used to store binary data, such as digitized picture or image.
- RAW data type can have a maximum length of 255 bytes.
- LONG RAW data type can contain upto 2GB.

❖ **DESCRIBE COMMAND**

- DESCRIBE or DESC (both are same) command to describe the structure of a table.
- DESCRIBE or DESC command shows the structure of table which include name of the column, data-type of column and the nullability which means, that column can contain null values or not.
- All of these features of table are described at the time of Creation of table.

Syntax:

```
SQL> DESCRIBE TABLE NAME;
     OR
SQL> DESC TABLE NAME;
```

❖ **SQL DDL (DATA DEFINITION LANGUAGE) COMMANDS:-**

➢ CREATE
➢ ALTER
➢ RENAME
➢ TRUNCATE
➢ DROP

➢ **CREATE**

- Create command is used to create a table in database.

Syntax:

```
SQL> CREATE TABLE TABLE NAME
( COLUMNNAME_1  DATATYPE(DATASIZE),
COLUMNNAME_2  DATATYPE(DATASIZE),
……….
COLUMNNAME_NDATATYPE(DATASIZE) );
```

Example:

```
SQL> CREATE TABLE CLIENT_MASTER (CLIENT_NO VARCHAR2(6), NAME
    VARCHAR2(20), CITY  VARCHAR2(15), PINCODE NUMBER(8), STATE
    VARCHAR2(15));
```

Show the Structure of a Table:

Syntax:

```
SQL> DESCRIBE CLIENT_MASTER;
NAME                          NULL?                          TYPE
-------------------------------------------------------------------
CLIENT_NO                                               VARCHAR2(6)
NAME                                                    VARCHAR2(20)
CITY                                                    VARCHAR2(15)
PINCODE                                                 NUMBER(8)
STATE                                                   VARCHAR2(15)
```

- **ALTER**
  - ALTER command is used to ALTER (Modify structure of) a table in database.
  - ALTER command is used in five ways.
    1. To add new column in table.
    2. To modify data type or data size of existing column of table.
    3. To drop (remove) the existing column of table.
    4. To rename the name of existing table.
    5. To rename the name of existing column of table.

Syntax: (1st way- to add new column)

```
SQL> ALTER TABLE TABLENAME ADD
(
 NEW_COLUMNNAME_1   DATATYPE(DATASIZE),
 NEW_COLUMNNAME_2   DATATYPE(DATASIZE),
……….
NEW_COLUMNNAME_NDATATYPE(DATASIZE)
);
```

Example:

```
SQL> ALTER  TABLE  CLIENT_MASTER  ADD
(
MOBILE_NO NUMBER(8), EMAIL CHAR(15)
);
```

Show the Structure of a Table:

Syntax:

```
SQL> DESCRIBE CLIENT_MASTER;
NAME                        NULL?                        TYPE
-----------------------------------------------------------------
CLIENT_NO                                         VARCHAR2(6)
NAME                                              VARCHAR2(20)
CITY                                              VARCHAR2(15)
PINCODE                                           NUMBER(8)
STATE                                             VARCHAR2(15)
MOBILE_NO                                          NUMBER(8)
EMAIL                                              CHAR(15)
```

Syntax: (2nd way-modify data type or data size)

```
SQL> ALTER TABLE TABLENAME MODIFY
(
EXISTING_COLUMNNAME_1  NEW_DATATYPE (NEW_DATASIZE),
EXISTING_COLUMNNAME_2  NEW_DATATYPE (NEW_DATASIZE),
……….
EXISTING_COLUMNNAME_N  NEW_DATATYPE(NEW_DATASIZE)
);
```

Example:

```
SQL> ALTER  TABLE  CLIENT_MASTER  MODIFY
( MOBILE_NO NUMBER(10), EMAIL VARCHAR2(15));
```

Show the Structure of a Table:

Syntax:

```
SQL> DESCRIBE CLIENT_MASTER;
NAME                        NULL?                        TYPE
-----------------------------------------------------------------
CLIENT_NO                                         VARCHAR2(6)
NAME                                              VARCHAR2(20)
CITY                                              VARCHAR2(15)
PINCODE                                            NUMBER(8)
STATE                                             VARCHAR2(15)
MOBILE_NO                                        NUMBER(10)
EMAIL                                            VARCHAR2(15)
```

Syntax: (3rd way-remove the column)

```
SQL> ALTER TABLE  TABLENAME  DROP COLUMN COLUMNNAME;
```

Example:

```
SQL> ALTER  TABLE  CLIENT_MASTER  DROP COLUMN MOBILE_NO;
```

Show the Structure of a Table:

Syntax:

```
SQL> DESCRIBE CLIENT_MASTER;
NAME                        NULL?                        TYPE
-----------------------------------------------------------------
CLIENT_NO                                         VARCHAR2(6)
NAME                                              VARCHAR2(20)
CITY                                              VARCHAR2(15)
PINCODE                                           NUMBER(8)
STATE                                            VARCHAR2(15)
```

```
EMAIL                                          VARCHAR2(15)
```

Syntax: (4th way-rename table name)

```
SQL> ALTER TABLE  OLD_TABLENAME  RENAME TO NEW_TABLENAME;
```

Example:

```
SQL> ALTER  TABLE  CLIENT_MASTER  RENAME TO CLIENT_MASTER_COPY;
```

Show the Structure of a Table:

Syntax:

```
SQL> DESCRIBE CLIENT_MASTER_COPY;
NAME                      NULL?                     TYPE
------------------------------------------------------------
CLIENT_NO                                       VARCHAR2(6)
NAME                                            VARCHAR2(20)
CITY                                            VARCHAR2(15)
PINCODE                                         NUMBER(8)
STATE                                           VARCHAR2(15)
EMAIL                                           VARCHAR2(15)
```

Syntax: (5th way-rename the column name)

```
SQL> ALTER TABLE   TABLENAME   RENAME COLUMN OLD_COLUMNNAME
TO NEW_COLUMNNAME;
```

Example:

```
SQL> ALTER  TABLE  CLIENT_MASTER  RENAME COLUMNEMAIL TO
EMAIL_ID;
```

Show the Structure of a Table:

Syntax:

```
SQL> DESCRIBE CLIENT_MASTER;
NAME                      NULL?                     TYPE
------------------------------------------------------------
CLIENT_NO                                       VARCHAR2(6)
NAME                                            VARCHAR2(20)
CITY                                            VARCHAR2(15)
PINCODE                                          NUMBER(8)
STATE                                           VARCHAR2(15)
EMAIL_ID                                         VARCHAR2(15)
```

➢ **RENAME**

- RENAME command is used to give new name of table.

Syntax:

```
SQL> RENAME OLD_TABLENAME TO NEW_TABLENAME;
```

Example:

```
SQL> RENAME CLIENT_MASTER_COPY  RENAME TO CLIENT_MASTER;
```

➢ **TRUNCATE**

- TRUNCATE command is used to remove all records from a table, including all memory allocated for the records.

Syntax:

```
SQL> TRUNCATE  TABLE  TABLE NAME;
```

Example:

SQL>TRUNCATE TABLE CLIENT_MASTER;

- **DROP**
  - DROP command is used to delete all records of a table along with its structure in database.

Syntax:

SQL> DROP TABLE TABLE NAME;

Example:

SQL>DROP TABLE CLIENT_MASTER;

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code / Solutions to queries:

K. Practical related Quiz/Exercise.

1. The _____ command is used to completely remove a table from the database.
   A. INSERT ,
   B. ALTER
   C. DROP
   D. CREATE
2. The _____ command is used to modify columns in a table
   A. DROP
   B. INSERT
   C. ALTER
   D. CREATE
3. Pick the element which you must specify while creating a table
   A. Column name
   B. Column Data type
   C. Column size
   D. All of the above
4. Which of the following command is used to see the structure of a table
   A. UPDATE
   B. SHOW
   C. DESCRIBE
   D. SPOOL
5. What does NUMBER (8, 2) in oracle mean?
   A. It means there are 8 digits in total, 6 digits before the decimal and 2 after the decimal
   B. It means there are 10 digits in total with 8 digits before the decimal and 2 after decimal
   C. It means there are 2 digits before the decimal and 8 after the decimal point
   D. None of the above.

L. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No.4:

Implement SQL queries to perform various DML Commands.

Note :

- ✓ You can use tables created in PRACTICAL 3 or default tables available in HR schema to perform any DML commands
- ✓ You can list available default tables in HR Schema using below Query

```
SELECT OWNER, TABLE_NAME FROM DBA_TABLES WHERE OWNER='HR';
```

HR Table Descriptions

Table COUNTRIES

```
Name                                   Null?    Type
--------------------------------------- -------- -------------------------
COUNTRY_ID                             NOT      NULL CHAR(2)
COUNTRY_NAME                                    VARCHAR2(40)
REGION_ID                                       NUMBER
```

Table DEPARTMENTS

```
Name                                   Null?              Type
--------------------------------------- -------- -------------------------
DEPARTMENT_ID                             NOT NULL        NUMBER(4)
DEPARTMENT_NAME                           NOT NULL       VARCHAR2(30)
     MANAGER_ID                                          NUMBER(6)
LOCATION_ID                                              NUMBER(4)
```

Table EMPLOYEES

```
Name                                  Null?                Type
--------------------------------------- --------  -------------------------------
EMPLOYEE_ID                            NOT NULL          NUMBER(6)
FIRST_NAME                                               VARCHAR2(20)
LAST_NAME                                                NOT NULL VARCHAR2(25)
EMAIL                                                    NOT NULL VARCHAR2(25)
PHONE_NUMBER                                             VARCHAR2(20)
HIRE_DATE                               NOT NULL         DATE
JOB_ID                                 NOT NULL          VARCHAR2(10)
SALARY                                                   NUMBER(8,2)
COMMISSION_PCT                                           NUMBER(2,2)
MANAGER_ID                                               NUMBER(6)
DEPARTMENT_ID                                            NUMBER(4)
```

Table JOBS

```
Name                              Null?              Type
--------------------------------------- -------- -------------------------
JOB_ID                          NOT NULL          VARCHAR2(10)
JOB_TITLE                       NOT NULL            VARCHAR2(35)
MIN_SALARY                                        NUMBER(6)
MAX_SALARY                                         NUMBER(6)
```

Table JOB_HISTORY

```
 Name                                      Null?      Type
 ----------------------------------------- -------- ----------------------------
 EMPLOYEE_ID                               NOT NULL NUMBER(6)
 START_DATE                                NOT NULL DATE
 END_DATE                                  NOT NULL DATE
 JOB_ID                                    NOT NULL VARCHAR2(10)
 DEPARTMENT_ID                                      NUMBER(4)
```

Table LOCATIONS

```
 Name                                      Null?      Type
 ----------------------------------------- -------- ----------------------------
 LOCATION_ID                               NOT NULL NUMBER(4)
 STREET_ADDRESS                                     VARCHAR2(40)
 POSTAL_CODE                                        VARCHAR2(12)
 CITY                                      NOT NULL VARCHAR2(30)
 STATE_PROVINCE                                     VARCHAR2(25)
 COUNTRY_ID                                         CHAR(2)
```

Table REGIONS

```
 Name                                      Null?      Type
 ----------------------------------------- -------- ----------------------------
 REGION_ID                                 NOT NULL NUMBER
 REGION_NAME                                        VARCHAR2(25)
```

A. Objective:

To perform various Data Manipulation Language (DML) commands is to enable users to interact with a database and modify its contents in a structured and controlled manner.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL queries

D. Expected Course Outcomes(Cos)

Perform queries on datasets using SQL*Plus

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using oracle software

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. Prerequisite Theory:

❖ **SQL DML (DATA MANIPLUATION LANGUAGE) COMMANDS:-**

➢INSERT
➢UPDATE
➢DELETE

➢**<u>INSERT</u>**

- Insert command is Used to insert data into a table or create a new row in table:
- We have two methods to insert data in a table
  1. By value method
  2. By address method

Syntax: (1st way-BY value method)

1st Way

SQL>INSERT INTO TABLENAME VALUES (VALUE_1,VALUE_2, VALUE_3 …. VALUE_N);

OR

2nd Way

SQL> INSERT INTO TABLENAME (COLUMN_1, COLUMN_2, COLUMN_3 ………COLUMN_N) VALUES (VALUE_1, VALUE_2, VALUE_3 …. VALUE_N);

Example:

1st Way

SQL> INSERT INTO CLIENT_MASTER VALUES (‘C00001’, ’RAHUL’, ’MUMBAI’, 400054,’ MAHARASHTRA’);

OR

2nd Way

```
SQL>INSERT INTO CLIENT_MASTER (CLIENT_NO, NAME,CITY, PINCODE,
STATE) VALUES (‘C00001’, ’RAHUL’, ’MUMBAI’, 400054, ’MAHARASHTRA’);
[INSERT MORE VALUE]
SQL>INSERT INTO CLIENT_MASTER VALUES (‘C00002’, ’MANISH’,
’BANGALORE’,560001, ’KARNATAKA’);
```

To insert a new record again you have to type entire insert command, if there are lot of records this will be difficult. This will be avoided by using address method.

Show the Records of a Table:

Syntax:

```
SQL> select * from  client_master;
Client_no       Name        City          Pincode      State
-----------------------------------------------------------------------
 C00001         RAHUL       Mumbai        400054       Maharashtra
 C00002         MANISH      Bangalore     560001       Karnataka
```

Syntax: (2nd way-BY address method)

```
SQL>INSERT INTO TABLENAME VALUES (&COLUMN_1, &COLUMN_2,….
 & COLUMN_N);
                                OR
SQL> INSERT INTO TABLENAME(COLUMN_1, COLUMN_2, COLUMN_3
………COLUMN_N) VALUES (&COLUMN_1, &COLUMN_2, &COLUMN_3 ….
&COLUMN_N);
```

This will prompt you for the values but for every insert you have to use forward slash .

Example:

```
SQL> INSERT INTO CLIENT_MASTER VALUES (‘&CLIENT_NO’,
'&NAME', ‘&CITY’, &PINCODE, ’&STATE ’);
Enter value for client_no: C0001
Enter value for name: Rahul
Enter value for city: Mumbai
Enter value for pincode: 400054
Enter value for state: Maharashtra

SQL>
Enter value for client_no: C0002
Enter value for name: Manish
Enter value for city: Bangalore
Enter value for pincode: 560001
Enter value for state: Karnataka
```

Show the Records of a Table:

Syntax:

```
SQL> SELECT * FROM CLIENT_MASTER;
 CLIENT_NO     NAME          CITY       PINCODE          STATE
-----------------------------------------------------------------------
 C00001        RAHUL       MUMBAI       400054          MAHARASHTRA
 C00002        MANISH      BANGALO     560001             KARNATAKA
```

➢ UPDATE

- The UPDATE command is used to change or modify data of a table
- The Update command is used to update selected rows from table or all the rows from table

Syntax:(update selected rows)

SQL> UPDATE TABLENAME SET COLUMNNAME_1 = EXPRESSION_1, COLUMNNAME_2 = EXPRESSION_2 WHERE CONDITION;

Example:

SQL>UPDATE CLIENT_MASTER SET CITY='BOMBAY' WHERE CLIENT_NO='C00002';

Show the Records of a Table:

Syntax:

SQL> SELECT * FROM CLIENT_MASTER;

CLIENT_NO	NAME	CITY	PINCODE	STATE
C00001	RAHUL	MUMBAI	400054	MAHARASHTRA
C00002	MANISH	BOMBAY	560001	KARNATAKA

Syntax:(update all rows)

SQL>UPDATE TABLENAME SET COLUMNNAME_1 = EXPRESSION_1;

Example:

SQL>UPDATE CLIENT_MASTER SET NAME = 'OHM';

Show the Records of a Table:

Syntax:

SQL> SELECT * FROM CLIENT_MASTER;

CLIENT_NO	NAME	CITY	PINCODE	STATE
C00001	OHM	MUMBAI	400054	MAHARASHTRA
C00002	OHM	BOMBAY	560001	KARNATAKA

➢ DELETE

- The DELETE command is used to delete data or rows from a table
- The delete command is used to delete selected rows from table or All the rows from table

Syntax: (delete selected rows)

SQL> DELETE FROM TABLENAME WHERE CONDITION;

Example:

SQL> DELETE FROM CLIENT_MASTER WHERE CLIENT_NO='C00001';

Show the Records of a Table:

Syntax:

SQL> SELECT * FROM CLIENT_MASTER;

CLIENT_NO	NAME	CITY	PINCODE	STATE
C00002	OHM	BOMBAY	560001	KARNATAKA

Syntax: (delete all rows)

SQL> DELETE FROM TABLE NAME;

Example:

SQL> DELETE FROM CLIENT_MASTER;

Show the Records of a Table:

Syntax:

```
SQL> SELECT * FROM CLIENT_MASTER;
SQL>No Rows selected
```

❖ SELECT

➢ The SELECT command is used to retrieve selected rows from one or more tables.

Syntax: (retrieve all table data)

```
SQL>SELECT * FROM  TABLE_NAME;
```

Example:

```
SQL> SELECT * FROM CLIENT_MASTER;
```

Syntax: (retrieve particular columns of a table)

```
SQL>SELECT COLUMNNAME_1, COLUMNNAME_2  FROM  TABLE_NAME;
SQL> SELECT NAME, CITY FROM CLIENT_MASTER;
```

Syntax: (retrieve particular column of particular row of a table)

```
SQL> SELECT COLUMNNAME_N  FROM   TABLE_NAME  WHERE  CONDITION;
SQL>SELECT  NAME  FROM CLIENT_MASTER WHERE CITY='BOMBAY';
```

Syntax: (retrieve particular rows of a table)

```
SQL> SELECT * FROM   TABLE_NAME  WHERE  CONDITION;
SQL>SELECT * FROM CLIENT_MASTER WHERE CITY='BOMBAY';
```

❖ SQL Operators

➢ Arithmetic Operators

- Oracle allows arithmetic operators to use while viewing records from table or while performing data manipulation operations such as Insert, Update and Delete.
- These are:

+ Addition
** Exponentiation
- Subtraction
* Multiplication
() Enclosed operation
/ Division

Example:

```
SQL>Select product_no, description, sell_price * 0.05 from product_master;
```

➢ Logical Operators

- The AND Operator
- The OR Operator
- The NOT Operator

➢ The AND Operator

- The AND Operator allows creating an SQL statement based on two or more conditions being met.
- It can be used in any valid SQL statement such as select, insert, or delete.

Example:

```
SQL>SELECT PRODUCT_NO, DESCRIPTION, SELL_PRICE * 0.05 FROM
PRODUCT_MASTER WHERE SELL_PRICE BETWEEN 500 AND 1100;
```

➢ **The OR Operator**

- The OR condition allows creating an SQL statement where records are returned when any one of the conditions are met
- It can be used in any valid SQL statement such as select, insert, or delete.

Example:

```
SQL>SELECT CLIENT_NO, NAME, CITY, PINCODE FROM CLIENT_MASTER
        WHERE PINCODE=4000054 OR PINCODE=4000057;
```

➢ **The NOT Operator**

- The Oracle engine will process all rows in a table and display only those Records that do not satisfy the condition specified

Example:

```
SQL>SELECT * FROM CLIENT_MASTER  WHERE NOT (  CITY='BOMBAY' OR
CITY='DELHI');
```

➢ **Comparison Operators**

- Comparison operators are used in condition to compare one expression with other.
- The comparison operators are =, <, >, >=, <=, !=, between, like, is null and in operators

➢ **Between operator**

- Between operator is used to check between two values or specific range

Example:

```
SQL>SELECT * FROM SALESMAN_MASTER WHERE SALARY BETWEEN 5000
AND 8000;
```

The above select statement will display only those rows where salary of salesman is between 5000 and 8000.

➢ **In operator:**

- The IN operator can be used to select rows that match one of the values in a list.

```
SQL> SELECT * FROM CLIENT_MASTER WHERE CLIENT_NO IN(C00001,
C00003);
```

The above query will retrieve only those rows where client_no is either in C00001 or C00003

➢ **Like operator:**

- The Like operator is used to search character pattern.
- The like operator is used with special character % and _(underscore)

```
SQL> SELECT * FROM CLIENT_MASTER WHERE CITY LIKE ' B% ';
```

The above select statement will display only those rows where city is start with 'b' followed by any number of any characters.

% sign is used to refer number of character (it similar to * asterisk wildcard in DOS).

While _(underscore) is used to refer single character.

```
SQL> SELECT * FROM CLIENT_MASTER WHERE NAME LIKE '_AHUL';
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code / Solutions to queries:

K. Practical related Quiz.

1. Which of the following is true about inserting news rows to a table?

   A - You must list values in the default order of the columns in the table.

   B - You can also list the columns in the INSERT clause.

   C - You can use the INSERT statement to add rows from one table to another.

   D - All of the above.

2. Which of the following code will successfully delete the table LOCATIONS from the database?

A - DROP TABLE locations;
B - DELETE TABLE locations;
C - TRUNCATE TABLE locations;
D - None of the above.

3. Which operator is used to compare a value to a specified list of values?
   A. ANY
   B. BETWEEN
   C. ALL
   D. IN
4. What operator tests column for absence of data
   A. NOT Operator
   B. Exists Operator
   C. IS NULL Operator
   D. None of the above
5. In which of the following cases a DML statement is not executed?
   A. When existing rows are modified.
   B. When a table is deleted.
   C. When some rows are deleted.
   D. All of the above

L. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No. 5:

Implement SQL queries using Date functions like add-months, months-between, round, nextday, truncate etc.

Write down the queries using date function:-

1. Find a date after adding 4 months to ’01-06-19’.
2. Find a total months between ’01-01-19’ to ’01-05019’.
3. Find a last date of ’01-02-‘19’.
4. Find out date of next Tuesday after ’18-06-19’.
5. Find the round format date for ‘17-06-19 12:35pm’, ‘17-06-19 12:35am’ and ‘17-06-19 01:30pm’.
6. Find the trunc format date for ‘17-06-19 12:35pm’, ‘17-06-19 12:35am’ and ‘17-06-19 01:30pm’.
7. Find out the date of next Sunday after today.

A. Objective:

SQL provides various date functions to perform common operations on date and time values, such as extracting date and time components, calculating differences between dates, and formatting dates in different ways

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL queries

D. Expected Course Outcomes(Cos)

Perform joins, sub-queries and nested queries on multiple tables using SQL*plus

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using SQL

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. Prerequisite Theory:

❖ SQL DATE FUNCTIONS:-

- ➢ADD_MONTHS
- ➢MONTHS_BETWEEN
- ➢LAST_DAY
- ➢NEXT_DAY
- ➢ROUND
- ➢TRUNC

NOTE:- CONSIDER '31-DEC-2012' AS A SYSDATE.

➢ADD_MONTHS

- ADD_MONTHS function returns new date after adding the number of months specified in the function.

Syntax:

```
SQL> ADD_MONTHS (D, N);
```

Example:

```
SQL> SELECT ADD_MONTHS (SYSDATE,3) "ADD MONTHS" FROM DUAL;
SQL>ADD MONTHS
        31-MAR-13
```

- IF n IS NEGATIVE, Then n MONTH will be subtracted.

```
SQL> SELECT ADD_MONTHS (SYSDATE,-3) "ADD MONTHS" FROM DUAL;
SQL>ADD MONTHS
        30-SEP-12
```

➢MONTHS_BETWEEN

- MONTHS_BETWEEN function returns number of months between date1 and date2.

Syntax:

```
SQL>MONTHS_BETWEEN (DATE1, DATE2);
```

Example:

```
SQL>SELECT MONTHS_BETWEEN ('31-MAR-13','31-DEC-12') "MONTHS BETWEEN" FROM DUAL;
SQL>MONTHS BETWEEN
        3
```

➢LAST_DAY

- LAST_DAY function returns the last date of the month specified with the function.

Syntax:

SQL>LAST_DAY (DATE);

Example:

```
SQL>SELECT LAST_DAY ('1-MAR-13') "LASTDAY" FROM DUAL;
SQL>LASTDAY
         31-MAR-13
```

➢NEXT_DAY

- NEXT_DAY function returns the date of the next named weekday specified by day relative to date.

Syntax:

SQL>NEXT_DAY (DATE, DAY);

Example:

```
SQL> SELECT NEXT_DAY ('3-JUNE-19','SUNDAY') "NEXTDAY" FROM DUAL;
SQL> NEXTDAY
         09-JUNE-19
```

➢ROUND

- ROUND function returns the rounded date according to format.
- A format can be any valid format.
- If format is omitted, date is rounded to the next day if time is 12.00 pm or later otherwise return today's date.

Syntax:

SQL>ROUND (DATE, FORMAT);

Example:

```
SQL>SELECT ROUND(TO_DATE('31-DEC-12 03:30:45 PM','DD-MM-YY HH:MI:SS PM')) FROM DUAL;
SQL>ROUND(TO_
         ---------
         01-JAN-13
SQL> SELECT ROUND(TO_DATE('31-DEC-12 12:00:00 PM','DD-MM-YY HH:MI:SS PM')) FROM DUAL;
SQL>ROUND(TO_
         ---------
         01-JAN-13
SQL> SELECT ROUND(TO_DATE('31-DEC-12 03:30:45 AM','DD-MM-YY HH:MI:SS PM')) FROM DUAL;
SQL>ROUND(TO_
         ---------
         31-DEC-12
```

➢TRUNC

- TRUNC function returns the truncated date according to format.
- A format can be any valid format.
- If format is omitted, date is truncated to 12.00 am.

Syntax:

```
SQL>TRUNC (DATE, FORMAT);
```

Example:

```
SQL>SELECT TRUNC(TO_DATE('31-DEC-12 03:30:45 PM','DD-MM-YY HH:MI:SS
PM')) FROM DUAL;
SQL>TRUNC(TO_
        ---------
        31-DEC-12
SQL> SELECT TRUNC(TO_DATE('31-DEC-12 12:00:00 PM','DD-MM-YY HH:MI:SS
PM')) FROM DUAL;
SQL>TRUNC(TO_
        ---------
        31-DEC-12
SQL> SELECT TRUNC(TO_DATE('31-DEC-12 03:30:45 AM','DD-MM-YY HH:MI:SS
PM')) FROM DUAL;
SQL>TRUNC(TO_
        ---------
        31-DEC-12
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code / Solutions to queries:

K. Practical related Quiz

1. Result of the below two queries will be:

```
SELECT DATEDIFF(week,'2005-12-31 23:59:59.9999999','2006-01-01
00:00:00.0000000');

SELECT DATEDIFF(hour,'2005-12-31 23:59:59.9999999','2006-01-01
00:00:00.0000000');
```

A 24, 1
B 1, 24
C 1, 1
D None of the above

2. Result of the below query will be:

```
SET DATEFORMAT mdy;
SELECT ISDATE('12/31/208');
```

A 0
B 1
C 2
D 3.

3. When you convert to date and time data types, SQL rejects all values it cannot recognize as dates or times.

A True

B False

4. If result of below query :

```
select CONVERT(VARCHAR(19),GETDATE())
```

is: Jul 29 2014 9:46AM

what will be the result of below query:select

```
CONVERT(VARCHAR(10),GETDATE(),10)
```

A Jul 29 2014
B 07-29-14 9:46AM
C 07-29-14
D Jul 29 201

5. Which of the following function checks whether the expression is a valid date or not?

A ISDATE
B ISDAY
C ISVALID
D ISYEAR

L. References / Suggestions

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No .6:

Implement SQL queries using Numeric functions like abs, ceil, power, mod, round, trunc, sqrt etc. and Character Functions like initcap, lower, upper, ltrim, rtrim, replace, substring, instr etc..

Write down the queries using numeric function:-

1. Find the absolute value of -15.
2. Find the square root of 81.
3. Find the value for 3 raised to power 4.
4. Find the remainder for 16 divided by 5.
5. Find the largest integer value which is greater than or equal to -27.2.
6. Find the smallest integer value which is less than or equal to -24.2.
7. Find the value for 182.284 which is rounded to -2.
8. Find the value for 182.284 which is rounded to 1.
9. Find the value for 182.284 which is truncated to -2.
10. Find the value for 182.284 which is truncated to 1.
11. Find the value for e which is raised to power 4.

Write down the queries using character function:-

Note : Consider Employees table from HR schema to solve queries.

1. Count number of characters in a string “Computer Engineering”.
2. Count number of characters in each employee’s name.
3. Convert string “COMPUTER” in lowercase.
4. Display fisrt name of all employees in lowercase.
5. Display last name of all employees in uppercase.
6. Convert string “oracle10g” in uppercase.
7. Display first letter of each word in a string “character function” in uppercase.
8. Extract 11 characters from the string “Computer Engineering”, starting from 12th character.
9. Extract first 3 characters from employee’s first name.
10. Display last name of all employees’ right justified with total length of 20 characters, fill up the blank characters with “#”.
11. Display last name of all employees left justified with total length 15 characters, fill up the blank characters with “*”.
12. Remove characters “gbrsea” from string “greatest” from left side.
13. Change character “ornt” by “xynt” from the string “government”.
14. Change the word “govern” by “suppli” in a string “government”.
15. Display ascii values of ‘s’ ,’A’ and ‘a’.
16. Find the first occurrence of base in string ‘Database’.

A. Objective:

Numeric functions are used to perform mathematical operations, while character functions are used to manipulate and perform operations on character data

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL queries

D. Expected Course Outcomes(Cos)

Perform joins, sub-queries and nested queries on multiple tables using SQL*plus.

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using SQL

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. Prerequisite Theory:

❖ **SQL NUMERIC FUNCTIONS:-**

1) ABS 2) CEIL 3) EXP 4)FLOOR 5) POWER 6) MOD
7) ROUND 8) TRUNC 9) SQRT

➢ **ABS()**

- **ABS()** function returns absolute value.

Syntax: ABS (N);

Example:

```
SQL> SELECT ABS (3), ABS(-3) “ABSOLUTEVALUE” FROM DUAL;
         ABSOLUTEVALUE ABSOLUTEVALUE
              3             3
```

- **CEIL( )**
  - **CEIL()** function returns the smallest integer that is greater than or equal to a specific value.

Syntax: CEIL (N);

Example:

```
SQL> SELECT CEIL(-25.4)"CEIL1",CEIL(25.4)"CEIL2" FROM DUAL;
             CEIL1      CEIL2
           ---------- ----------
             -25         26
```

- **EXP()**
  - **EXP()** function returns **e** raised to the **nth** power, where e=2.71828183.

Syntax: EXP (N);

Example:

```
SQL> SELECT EXP (’1’) “EXP” FROM DUAL;
SQL> EXP
         2.71828183
```

- **FLOOR()**
  - **FLOOR()** function returns the greatest integer that is less than or equal to a specific value.

Syntax: FLOOR (N);

Example:

```
SQL>SELECT FLOOR (’25.4’) "FLOOR" ,FLOOR (’25.5’) "FLOOR",FLOOR (’25.5’)
"FLOOR" FROM DUAL;
SQL>FLOOR     FLOOR     FLOOR
          25        25        25
SQL> SELECT FLOOR (’-25.4’) "FLOOR" ,FLOOR (’-25.5’) "FLOOR",FLOOR (’-25.5’)
"FLOOR" FROM DUAL;
SQL> FLOOR     FLOOR     FLOOR
         - 26       -26       -26
```

- **POWER()**
  - **POWER()** function returns the value raised to a given positive exponent.

Syntax: POWER(VALUE,EXPONENT);

Example:

```
SQL> SELECT POWER (3,2) “POWER” FROM DUAL;
SQL> POWER
         9
```

- **MOD()**
  - **MOD()** function divides a value by a divisor and returns the remainder.

Syntax: MOD(VALUE,DIVISER);

Example:

```
SQL> SELECT MOD (9,2) “REMAINDER” FROM DUAL;
SQL> REMAINDER
        1
```

- **ROUND()**
  - **ROUND()** function rounds a number to given number of digits of precision.

  Syntax: ROUND(VALUE,PRECISION);

  Example:

```
SQL>SELECT ROUND (255.555,1) "ROUND",ROUND (255.555,2) "ROUND",ROUND
(255.555,3) "ROUND" FROM DUAL;
SQL>ROUND ROUND ROUND
        255.6     255.56     255.555
```

- **TRUNC()**
  - **TRUNC()** function truncates digits of precision from a number.

  Syntax: TRUNC(VALUE,PRECISION);

  Example:

```
SQL>SELECT TRUNC (255.555,1) "TRUNC",TRUNC (255.555,2) "TRUNC",TRUNC
(255.555,3) "TRUNC" FROM DUAL;
SQL>TRUNC TRUNC TRUNC
        255.5     255.55     255.555
```

- **SQRT()**
  - **SQRT()** function returns the square root of a given number.

  Syntax: SQRT(N);

  Example:

```
SQL> SELECT SQRT (9) “SQRT” FROM DUAL;
SQL> SQRT
        3
```

❖ **SQL CHARACTER FUNCTIONS:-**

1) INITCAP 2) LOWER 3) UPPER 4)LTRIM
5)RTRIM 6) TRANSLATE 7) REPLACE 8) SUBSTRING
9)LENGTH 10) LPAD 12) RPAD 13) ASCII

- **INITCAP()**
  - **INITCAP()** function converts any string or (column of table)with the first character of each word in UPPER CASE.

  Syntax: INITCAP(STRING);

  Example:

```
SQL> select initcap('database management system') “1stcharacterinuppercase” from dual;
SQL>1stcharacterinuppercase
        Database Management System
```

- **LOWER()**
  - **LOWER()** function converts any string or (column of table)into lowercase.

  Syntax: lower(string);

  Example:

```
SQL> select lower ('DATABASE') “lower” from dual;
SQL>lower
database
```

- **UPPER()**
  - **UPPER()** function converts any string or (column of table)into uppercase.

converts any string or (column of table) into uppercase.

Syntax: upper(string);

Example:

```
SQL> select upper ('database') “upper” from dual;
SQL>upper
        DATABASE
```

- **LTRIM()**
  - LTRIM() function returns a string with all characters contained in the set are removed from the left end of the string.

Syntax:

SQL>ltrim(,set);

Example: char

```
SQL> select ltrim('000123', '0')"ltrim1",ltrim('123123Tech', '123')  “ltrim2” from dual;
SQL>ltrim1ltrim2
        123     Tech
```

- **RTRIM()**
  - RTRIM() function returns a string with all characters contained in the set are removed from the right end of the string.

Syntax:

SQL>rtrim(char,set);

Example:

```
SQL> select rtrim('123000', '0')"rtrim1",rtrim('Tech123123', '123')
“rtrim2” from dual;
SQL> rtrim1rtrim2
        123     Tech
```

- **TRANSLATE()**
  - **TRANSLATE ( )** function Replace a sequence of character in a string with another set of characters.

Syntax: TRANSLATE(string1,string to replace, replacement string);

Example:

```
SQL> SELECT TRANSLATE (‘COMPUTER’,’COMPU’,HEA’) “TRANSLATESTRING”
FROM DUAL;
SQL>TRANSLATESTRING
        HEATER
```

- **REPLACE()**
  - REPLACE ( ) function Replace a sequence of characters in a string with another set of characters.

Syntax: REPLACE(string1,charactertobereplaced,characters);

Example:

```
SQL>SELECT REPLACE ('COMPUTER','UE','IL') "REPLACE" ,REPLACE
('COMPUTER','UT','IL') "REPLACE" FROM DUAL;
SQL>REPLACE  REPLACE
        -------- --------
        COMPUTER COMPILER
```

- **SUBSTRING()**
  - SUBSTRING( ) functions allows you to extract a substring from a string.

Syntax: SUBSTR (string, start position, length);

Example:

```
SQL>SELECT SUBSTR ('COMPUTER','1','4') "SUBSTRING" ,SUBSTR('COMPUTER','4','5') "SUBSTRING" FROM DUAL;
SQL> SUBSTRING     SUBSTRING
        ----       -----
        COMP    PUTER
```

- **Instr()**
  - SQL INSTR() function detects the first occurrence of a string or a character in the other string. Thus, the INSTR() function witnesses the position of the initial/first occurrence of any string/sub-string in another string data value.

Syntax: INSTR(string1, string2);

Example:

```
SQL>SELECT INSTR('JYPython', 'P');
SQL>  instr
      -----
       3
```

- **LENGTH( )**
  - **LENGTH( )** function returns the length of string(count number of characters).

Syntax:

SQL>length(string);

Example:

```
SQL> select length ('DATABASE') “length” from dual;
SQL>length
    8
```

- **LPAD( )**
  - **LPAD( )** function returns string which is left padded with string2 up to length n.

Syntax: lpad(string , n ,string2);

Example:

```
SQL>select lpad('database',15,'3330703') "lpad" from dual;
SQL> lpad
     ---------------
     3330703database
```

- **RPAD( )**
  - **RPAD( )** function returns string which is right padded with string2 up to length n.

Syntax: rpad (string , n ,string2);

Example:

```
SQL>select rpad('database',15,'3330703') "rpad" from dual;
SQL>rpad
     ---------------
     database3330703
```

- **ASCII( )**
  - **ASCII( )** function returns the ascii code of a charcter.

Syntax: ascii (charcter);

Example:

```
SQL>select ascii('d')"ascii",ascii('D')"ascii" from dual;
SQL>ascii      ascii
          ---------- ----------
          100        68
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code/ Solutions to queries :

K. Practical related Quiz.

1. What is true about Character functions?

A. They return only character values
B. They accept NUMBER values
C. They accept character arguments and can return both character and number values
D. They accept values of all data type

2. What will be the outcome of the following query?

SELECT lower(upper(initcap('Hello World'))) FROM dual;

A. Hello World
B. HELLO world
C. hello World
D. hello world

3. In what scenario would you want to use the UPPER function in SQL?

A. All text is numeric
B. The text values might be mixed-case
C. You need to convert the data to date format
D. All text is unreadable or mis-aligned

4. Which of the following can be used to measure the length of an input value?

A. QUOTENAME
B. LENGTH
C. DATALENGTH
D. LEN

5. Which of the following is used to replace a string with a different one, at a specified position?

A. FORMAT
B. STUFF
C. REPLICATE
D. REPLACE

L. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No.7:

Implement SQL queries using Conversion Functions like to- char, to-date, to-number and Group functions like Avg, Min, Max, Sum, Count, Decode etc.

Note : Consider HR.EMPLOYEES table to solve all queries.

Write down the queries using conversion and miscellaneous function:-

1. Convert '+01234.78' to number.
2. Convert a value 123789 to character using '9,99,999' format.
3. List out hire date in form of 'Saturday,14th feb,2009' for employee.(consider HR.EMPLOYEES table)
4. List out hire date in form of '23-march-1985' for all employee.(consider employee table)
5. If input value is 'MAX' then display message 'this is maximum', if input value is 'MIN' then display message 'this is minimum' otherwise display message 'this is equal'.

Write down the queries using GROUP function:-

Consider HR.EMPLOYEES table to solve all queries.

1. Find maximum salary from a table.
2. Find minimum salary from table.
3. Find sum of all and distinct salary from a table.
4. Find average of all and distinct average from a table.
5. Find total number of employees.
6. Find total number of rows for each column from a table.

A. Objective:

Implementing SQL conversion functions in SQL queries is to convert data from one data type to another data type and manipulate data that is stored in different formats and group functions is to perform calculations on a set of values that are grouped together based on a specific column or columns. These group functions are also known as aggregate functions because they aggregate multiple rows into a single result.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. **Expected Skills to be developed based on competency:**

Compilation, debugging, executing SQL queries

D. Expected Course Outcomes(Cos)

Perform joins, sub-queries and nested queries on multiple tables using SQL*plus.

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using SQL

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. **Prerequisite Theory:**

- **SQL CONVERSION FUNCTIONS:-**

- TO_NUMBER
- TO_CHAR
- TO_DATE

- **TO_NUMBER (CONVERTING CHARACTER TO NUMBER)**
  - **TO_NUMBER ( )** function converts a value of a character data type to number data type.
  - Returns equivalent numeric value to string.
  - String must consist of 0-9, decimal point and ‘+’ or ‘-‘sign.

Syntax:

SQL>TO_NUMBER(STRING);

Example:

```
SQL>SELECT TO_NUMBER('-123.3') "TO_NUMBER", TO_NUMBER('+123.3')
"TO_NUMBER", TO_NUMBER('123') "TO_NUMBER" FROM DUAL;
SQL> TO_NUMBER  TO_NUMBER  TO_NUMBER
     ----------  ----------  ----------
      -123.3      123.3       123
```

➢ TO_CHAR (CONVERTING DATE TO CHARACTER)

- **TO_CHAR ( )** function converts a value of DATE data type to CHAR value.
- It can also extract a part of the date, month or the year from the date value and use it for sorting or grouping of data according to the date, month or year.

Syntax:

```
SQL>TO_CHAR(DATE,FORMAT);
```

Example:

```
SQL>SELECT TO_CHAR (SYSDATE,'YYYY') "EXTRACTYEAR", TO_CHAR (SYSDATE,'MONTH') "EXTRACTMONTH" FROM DUAL;
SQL>EXTRACTYEAR   EXTRACTMONTH
       2019              JUNE
```

➢ TO_CHAR (CONVERTING NUMBER TO CHARACTER)

- **TO_CHAR ( )** function converts a value of NUMBER data type to CHAR value using optional format.
- **A** format consist ‘0’,’9’ and ‘,‘.

Syntax:

```
SQL>TO_CHAR (N, FORMAT);
```

Example:

```
SQL>SELECT TO_CHAR(123456,'09,0999'),TO_CHAR(123456,'99,09999') FROM DUAL;
SQL> TO_CHAR(    TO_CHAR(1
       --------     ---------
       12,3456      1,23456
```

➢ TO_DATE (CONVERTING CHARACTER TO DATE)

- **TO_CHAR ( )** function converts avalue of CHAR datatype to DATE data type value.

Syntax:

```
SQL>TO_DATE(CHAR, FORMAT);
```

Example:

```
SQL>SELECT TO_DATE ('06/06/19','DD/MM/YYYY') FROM DUAL;
SQL> TO_DATE('
       ---------
       06-JUN-19
```

➢ USEFUL DATE FORMATS FOR TO_CHAR AND TO_DATE FUNCTIONS:

FORMAT	SPECIFIES	FORMAT	SPECIFIES
MM	Number of months (1-12)	**YYY**	Last three digit of year: 986
MON	3-Letter month: JAN	**YY**	Last two digits of year: 86
MONTH	Full month: JUNE	**Y**	Last one digit of year: 6
DDD	No. of day of year	**YEAR**	Year spelled out
DD	No. of day of month	**WW**	No. of week in year
D	No. of day of week	**W**	No. of week in month
DY	3-letter day: MON	**HH**	Hour

DAY	Full day: SUNDAY	**MI**	Minute
YYYY	Four digit year: 1986	**SS**	Second

- **USEFUL FORMATS THAT CAN BE USED ONLY WITH TO_CHAR:**

RMAT	**ECIFIES**
I	oduces 6TH ,6Th or 6th based on DDTH, DdTH, ddTH
	rces number to spell out, like -five
TH/THSP	rces number to spell out, like -fifth

❖ SQL MISCELLANEOUS FUNCTIONS:-

- DECODE
  - **DECODE** function has the functionality of an IF-THEN-ELSE statement.

Syntax:

SQL>DECODE(EXP, EXP1 THEN RESULT1,EXP2 THEN RESULT2,DEFAULT);

Example:

SQL>SELECT DECODE (1,1,1000,2,2000,3000) "DECODE", DECODE (2,1,1000,2,2000,3000) "DECODE", DECODE (3,1,1000,2,2000,3000)"DECODE" FROM DUAL;

```
SQL> DECODE       DECODE     DECODE
        ----------      ----------     ----------
        1000           2000          3000
```

❖ SQL GROUP(AGGREGATE)FUNCTIONS:-

- AVG
- SUM
- MIN
- MAX
- COUNT

NOTE: consider following COURSE table for group function example.

TABLE NAME: COURSE

ID	**NAME**	**FEE**	**SEATS**
1	MPUTER	000	
2		00	
3	ECHANICAL	00	
4	INTING	00	
5	VIL	000	
6	ECTRICAL	LL	LL

- **AVG**
  - **AVG ( )** function returns average value for a given column.
  - AVG is allowed only on numeric data types.

Syntax:

SQL>**AVG ([DISTINCT | ALL]*columnname*)**

- The DISTINCT qualifier eliminates duplicates. The ALL qualifier retains duplicates.

Example:

```
SQL>SELECT AVG (C_FEE)"avg",AVG (DISTINCT C_FEE)"avg",
AVG(C_SEATS)"avg",AVG(DISTINCT C_SEATS)"avg"FROM course;
SQL>   avg           avg                 avg                 avg
       ----------    ----------          ----------          ----------
       7600          7666.66667          22                  21.6666667
```

- **SUM**
  - **SUM ( )** function returns total sum for a given column.
  - SUM is allowed only on numeric data types.

  Syntax:

  SQL>**SUM ([DISTINCT | ALL]** *columnname***)**

  - The DISTINCT qualifier eliminates duplicates. The ALL qualifier retains duplicates.

  Example:

```
SQL>SELECT SUM (C_FEE) "sum", SUM (DISTINCT C_FEE)"sum",
SUM(C_SEATS)"sum", SUM(DISTINCT C_SEATS)"sum" FROM course;
SQL>sum           sum           sum           sum
       ----------    ----------    ----------    ----------
       38000         23000         110           65
```

- **MIN**
  - **MIN( )** function returns minimum value of a given column.
  - MIN is allowed only on numeric data types.

  Syntax: MIN(COLUMNNAME);

  Example:

```
SQL>SELECT MIN (C_FEE) "MIN", MIN (C_SEATS) "MIN" FROM COURSE;
SQL> MIN           MIN
       ----------    ----------
       5000          15
```

- **MAX**
  - **MAX( )** function returns maximum value of a given column.
  - MAX is allowed only on numeric data types.

  Syntax: MAX (COLUMNNAME);

  Example:

```
SQL> SELECT MAX (C_FEE) "MAX", MAX (C_SEATS) "MAX" FROM COURSE;
SQL>MAX           MAX
       ----------    ----------
       10000         30
```

- **COUNT(*)**
  - **COUNT (*)** function returns total no of rows in a table including duplicates and having null values.
  - COUNT is allowed only on numeric data types.

  Syntax: COUNT(*);

  Example:

```
SQL>SELECT COUNT(*) "NO. OF ROWS "FROM COURSE;
SQL> NO. OF ROWS
       ------------
      6
```

- **COUNT**

- **COUNT** function returns total no of rows in a table where column does not contain null values.
- COUNT is allowed only on numeric data types.

Syntax: COUNT ([DISTINCT| ALL] COLUMNNAME);

Example:

```
SQL> SELECT COUNT (*) "NO. OF ROWS ", COUNT (C_FEE) “NO.OF ROWS”,
COUNT(DISTINCT C_FEE) “NO.OF ROWS”, COUNT (C_SEATS) “NO.OF ROWS”,
COUNT (DISTINCT C_SEATS) “NO.OF ROWS”FROM COURSE;
SQL>NO. OF ROWS   NO.OF ROWS   NO.OF ROWS  NO.OF ROWS  NO.OF ROWS
      ------------     ----------    ----------    ----------   ----------
         6              5           3          5              3
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code/ Solutions to queries :

K. **Practical related Quiz.**

1. The _____ aggregation operation adds up all the values of the attribute
   A. add
   B. avg
   C. max
   D. sum

2. The _____ aggregation function is used to retrieve minimum value
   A. add
   B. minimum
   C. min
   D. sum

3. Which of the following statements is true regarding the COUNT function?

   A. COUNT (*) counts duplicate values and NULL values in columns of any data type.
   B. COUNT function cannot work with DATE datatypes.
   C. COUNT (DISTINCT job_id) returns the number of rows excluding rows containing duplicates and NULL values in the job_id column.
   D. A SELECT statement using the COUNT function with a DISTINCT keyword cannot have a WHERE clause.

4. Which of the below queries will format a value 1680 as $16,80.00?
   A. SELECT TO_CHAR(1680.00,'$99G99D99') FROM dual;
   B. SELECT TO_CHAR(1680.00,'$9,999V99') FROM dual;
   C. SELECT TO_CHAR(1680.00,'$9,999D99') FROM dual;
   D. SELECT TO_CHAR(1680.00,'$99G999D99') FROM dual;

5. Which of the following examples correctly uses the TO_NUMBER function to convert a string to a number?
   A TO_NUMBER('5')
   B TO_NUMBER('five')
   C TO_NUMBER(5)
   D TO_NUMBER('5.5')

L. **References / Suggestions (lab manual designer should give)**

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No.8 :

Implement SQL queries using Set operators like Union, union all, Intersect, Minus etc..

Write down the queries using SET OPERATORS:-

1. Find the employees who are either managers or sales representatives:
2. Find the employees who are both managers and sales representatives
3. Find the employees who are sales representatives but not managers
4. Find the names of departments that have either a manager or an administrative assistant:
5. Find the names of departments that have both a manager and an administrative assistant
6. Find the employees who have either a manager or a subordinate with the last name 'King'

A. Objective:

Write and execute SQL queries on various DML commands and use SQL operators and demonstrate use of SELECT statement.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL quesries

D. **Expected Course Outcomes(Cos)**

Perform joins, sub-queries and nested queries on multiple tables using SQL*plus

E. **Practical Outcome(PRo)**

Write data definition queries , compilation, debugging, executing using oracle software

F. **Expected Affective domain Outcome (ADos)**

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. **Prerequisite Theory:**

- ORACLE installation

❖ **SQL SET OPERATORS:-**

➢UNION
➢UNION ALL
➢INTERSECT
➢MINUS

Consider faculty_detail table to understand all example of set operators.

➢**UNION**

- The UNION set operator returns all distinct rows selected by either query, without ignoring the NULL values. That means any duplicate rows will be removed. (ascending by default)

Syntax:

```
SQL>SELECT COLUMNNAME FROM TABLENAME
        UNION
        SELECT COLUMNNAME FROM TABLENAME;
```

Example:

```
SQL>SELECT FNAME FROM FACULTY_DETAIL WHERE    SEMESTER=3
       UNION
SELECT FNAME FROM FACULTY_DETAIL WHERE
SEMESTER=5;
SQL>FNAME
        --------------------
        ADS
        BPP
        HJP
        JNA
```

```
          SBD
          SDS
          VAV
```

- **UNION ALL**
  - The UNION ALL set operator returns all rows selected by either query, without ignoring the NULL values. That means any duplicates will remain in the final result set.

Syntax:

```
SQL>SELECT COLUMNNAME FROM TABLENAME
         UNION ALL
         SELECT COLUMNNAME FROM TABLENAME;
```

Example:

```
SQL>SELECT FNAME FROM FACULTY_DETAIL    WHERE
SEMESTER=3
        UNION ALL
        SELECT FNAME FROM FACULTY_DETAIL WHERE
        SEMESTER=5;
SQL>FNAME
         --------------------
                  SBD
                  VAV
                  SDS
                  JNA
                  BPP
                  HJP
                  ADS
                  BPP
                  HJP
                  ADS
```

- **INTERSECT**
  - The INTERSECT set operator returns all distinct rows selected by both queries. That means only those rows common to both queries will be present in the final result set.

Syntax:

```
SQL>SELECT COLUMNNAME FROM TABLENAME
         INTERSECT
         SELECT COLUMNNAME FROM TABLENAME;
```

Example:

```
SQL>SELECT FNAME FROM FACULTY_DETAIL    WHERE
SEMESTER=3
        INTERSECT
        SELECT FNAME FROM FACULTY_DETAIL WHERE
        SEMESTER=5;
SQL> FNAME
      --------------------
         ADS
         BPP
```

```
            HJP
```

- **MINUS**
  - The MINUS set operator returns all distinct rows selected by the first query but not the second. This is functionally equivalent to the ANSI set operator EXCEPT DISTINCT.

Syntax:

```
SQL>SELECT COLUMNNAME FROM TABLENAME
        MINUS
        SELECT COLUMNNAME FROM TABLENAME;
```

Example:

```
SQL>SELECT FNAME FROM FACULTY_DETAIL    WHERE
SEMESTER=3
        MINUS
        SELECT FNAME FROM FACULTY_DETAIL WHERE
        SEMESTER=5;
SQL> FNAME
      --------------------
   JNA
         SBD
         SDS
         VAV
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code/Solutions to queries:

K. Practical related Quiz.

1. What is the purpose of using set operators in SQL?
   A. To perform calculations on individual columns.
   B. To transform data in a column based on a specified condition.
   C. To combine the results of two or more queries into a single result set.
   D. To group rows of data together based on a specified condition.

2. Which of the following set operators removes duplicates from the result set?
   A. UNION
   B. UNION ALL
   C. INTERSECT
   D. MINUS

3. Which of the following set operators retains duplicates in the result set?
   A. UNION
   B. UNION ALL
   C. INTERSECT
   D. MINUS

4. Which of the following SQL statements correctly uses the INTERSECT operator?
   A. SELECT * FROM table1 INTERSECT SELECT * FROM table2;
   B. SELECT * FROM table1 UNION ALL SELECT * FROM table2;
   C. SELECT * FROM table1 MINUS SELECT * FROM table2;
   D. SELECT * FROM table1 UNION SELECT * FROM table2;

5. What is the purpose of using the MINUS operator in SQL?
   A. To find all distinct values in one query that are not in another query.
   B. To combine the results of two or more queries into a single result set.
   C. To find the intersection of two queries.
   D. To perform calculations on individual columns.

L. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

M. Assessment-Rubrics

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Date: ……………

Practical No.9:

Retrieve data spread across various tables or same table using various Joins.

1. Write a query to retrieve the employee ID, first name, last name, department name, and job title of all employees who work in the Sales department.
2. Write a query to retrieve the employee ID, first name, last name, salary, and commission percentage of all employees who have a commission percentage greater than 10%
3. Write a query to retrieve the employee ID, first name, last name, department name, and manager name of all employees who work in the same department as their manager
4. Write a query to retrieve the employee ID, first name, last name, department name, and job title of all employees who have a manager whose last name is King.
5. Write a query to retrieve the employee ID, first name, last name, department name, job title, and salary of all employees who work in the same department as employee ID 176.
6. .

A. Objective:

Write and execute SQL queries on various DML commands and use SQL operators and demonstrate use of SELECT statement.

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL quesries

B. Expected Course Outcomes(Cos)

Perform joins, sub-queries and nested queries on multiple tables using SQL*plus.

C. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using oracle software

D. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

E. **Prerequisite Theory:**

- ORACLE installation
- Syntax of DDL Commands

F. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

G. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

H. **Source code / Solutions to queries:**

I. Practical related Quiz.

1. What is the purpose of using joins in SQL?
   A. To perform calculations on individual columns.
   B. To transform data in a column based on a specified condition.
   C. To combine data from two or more tables into a single result set.
   D. To group rows of data together based on a specified condition.

2. Which of the following types of join returns only the rows that have matching values in both tables?
   A. INNER JOIN
   B. LEFT JOIN
   C. RIGHT JOIN
   D. FULL OUTER JOIN

3. Which of the following types of join returns all the rows from the left table and the matching rows from the right table, and fills in missing values with NULL?
   A. INNER JOIN
   B. LEFT JOIN
   C. RIGHT JOIN
   D. FULL OUTER JOIN

4. Which of the following types of join returns all the rows from the right table and the matching rows from the left table, and fills in missing values with NULL?
   A. INNER JOIN
   B. LEFT JOIN
   C. RIGHT JOIN
   D. FULL OUTER JOIN

5. What is the purpose of using aliases in SQL joins?
   A. To rename tables or columns for clarity and readability.
   B. To limit the number of rows returned in the result set.
   C. To perform calculations on individual columns.
   D. To group rows of data together based on a specified condition.

J. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.html

K. Assessment-Rubrics

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• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

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Date: ……………

Practical No.10:

Perform queries to Create, alter and update views

1. Create a view called "employee_info" that shows the employee's first name, last name, job title, department name, and salary
2. Add a new column called "hire_date" to the "employee_info" view
3. Update the "employee_info" view to only show employees who have a salary greater than $50,000
4. Create a view named "my_view" that shows only the employees who belong to department 20
5. Alter the "my_view" view to show only the employees who belong to department 30
6. Drop the "my_view" view from the database

A. Objective:

- To perform queries to create, alter, and update views is to allow for efficient data manipulation and retrieval in a database management system. Views are essentially virtual tables that are based on the results of a query, and they provide a simplified, customized representation of the data stored in the underlying tables.
- Creating views can be useful for simplifying complex queries, reducing the amount of code needed to retrieve certain information, and providing controlled access to specific data

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL quesries

D. **Expected Course Outcomes(Cos)**

Apply rules on datasets using SQL*Plus constraints

E. **Practical Outcome(PRo)**

Write data definition queries , compilation, debugging, executing using oracle software

F. **Expected Affective domain Outcome (ADos)**

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. **Prerequisite Theory:**

- ORACLE installation
- Syntax of DDL Commands

H. **Resources/Equipment Required**

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. **Safety and necessary Precautions followed**

Shutdown computer system properly once the Lab hours are finished

J. **Source code / Solutions to queries :**

K. Practical related Quiz.

1. What is a view in SQL?
   A. A temporary table that is created in memory.
   B. A virtual table that is based on the result set of a SELECT statement.
   C. A table that is created and managed by the DBMS.
   D. A table that is used to store metadata about other tables in the database.

2. How do you create a view in SQL?
   A. CREATE VIEW view_name AS SELECT column_name(s) FROM table_name WHERE condition;
   B. CREATE TABLE view_name AS SELECT column_name(s) FROM table_name WHERE condition;
   C. CREATE VIEW view_name USING table_name WHERE condition;
   D. CREATE TABLE view_name USING SELECT column_name(s) FROM table_name WHERE condition;

3. How do you update a view in SQL?
   A. UPDATE view_name SET column_name = value WHERE condition;
   B. UPDATE table_name SET column_name = value WHERE condition;
   C. ALTER VIEW view_name AS SELECT column_name(s) FROM table_name WHERE condition;
   D. You cannot update a view in SQL.
4. How do you alter a view in SQL?
   A. ALTER VIEW view_name AS SELECT column_name(s) FROM table_name WHERE condition;
   B. ALTER TABLE view_name AS SELECT column_name(s) FROM table_name WHERE condition;
   C. UPDATE view_name SET column_name = value WHERE condition;
   D. You cannot alter a view in SQL.

5. What is the benefit of using a view in SQL?
   A. Views can improve query performance by reducing the amount of data retrieved.
   B. Views can be used to store data permanently.
   C. Views can be used to update data in multiple tables at once.
   D. Views can be used to create temporary tables that are stored in memory.

L. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.html

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
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Sign with Date

PRACTICAL 11: Implement SQL queries for CREATE USER, GRANT,REVOKE and DROP USER command.

Objective:

To understand the concept of administrative commands

Theory:

DATABASE is collection of coherent data.To create database we have :

Syntax:

CREATE DATABASE<database_name>

Example : CREATE DATABASE my_db;

TABLESPACE:

The oracle database consists of one or more logical storage units called *table spaces.* Each table space in an Oracle database consists of one or more files called *datafiles,* which are physical structures that confirm to the operating system in which Oracle is running.

Syntax:

```
        CREATE<tablespace name>
DATAFILE'C:\oraclexe\app\oracle\product\10.2.0\server \<file name.dbf ’SIZE 50M;
```

Example:

```
        Create tablespace te_cs DATAFILE
'C:\oraclexe\app\oracle\product\10.2.0\server\usr.dbf ’SIZE 50M;
```

CREATE USER:

The DBA creates user by executing CREATE USER statement.

The user is someone who connects to the database if enough privilege is granted.

Syntax:

```
SQL>  CREATE USER < username>         --   (name of user to be created )
      IDENTIFIED BY  <password>  --      (specifies that the user must login with this
      password)
```

SQL> user created

Eg: create user *James* identified by *bob*;

(The user does not have privilege at this time, it has to be granted.These privileges determinewhat user can do at database level.)

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 ofdatabase 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, tablecolumns. 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 privilegeson 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 changepassword by using ALTER USER statement.

Syntax:

Alter USER <*some user name*>

IDENTIFIED BY<*New password*>

Eg: ALTER

USER

James

IDENTIFIE

D BY sam

REVOKE:

REVOKE statement is used to remove privileges granted to other users. The privileges youspecify 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, roleis a predefined collection of previleges that are grouped together,thus privileges are easier toassign 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;

Source code :

Exercise:

1. Create user and implement the following commands on relation (Emp and Dept).
2. Develop a query to grant all privileges of employees table into departments table.
3. Develop a query to grant some privileges of employees table into departments table.
4. Develop a query to revoke all privileges of employees table from departments table.
5. Develop a query to revoke some privileges of employees table from departments table.

N. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.html

O. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No.12

Implement Practical 3 with Domain Integrity, Entity Integrity and Referential Integrity constraints.

A. Objective:

- To perform queries to domain integrity, entity integrity, and referential integrity constraints is to ensure that data in a database is consistent, accurate, and reliable..
- To ensure the quality and accuracy of data stored in a database

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. **Expected Skills to be developed based on competency:**

Compilation, debugging, executing SQL quesries

D. Expected Course Outcomes(Cos)

Apply rules on datasets using SQL*Plus constraints.

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using oracle software

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.

- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. **Prerequisite Theory:**

- Domain Integrity, Entity Integrity, and Referential Integrity are fundamental concepts in database management systems (DBMS) like Oracle. These constraints ensure that the data stored in the database is accurate, consistent, and valid.
    1. Domain Integrity: Domain Integrity ensures that the values entered in a column or attribute of a table conform to a specified data type or domain. For example, if a column is defined as storing only positive integers, any attempt to enter a negative number or a non-integer value will be rejected.
    2. Entity Integrity: Entity Integrity ensures that each row or record in a table has a unique identifier, typically a primary key. This constraint guarantees that there are no duplicate records in the table, ensuring that each record can be identified uniquely.
    3. Referential Integrity: Referential Integrity ensures that the relationships between tables are maintained by enforcing the consistency of foreign key values. For example, if a table has a foreign key constraint that references a primary key in another table, the referential integrity constraint ensures that any changes to the referenced primary key value are reflected in the foreign key value in the referencing table.
- In Oracle, these constraints can be defined when creating a table or added later using the ALTER TABLE statement.
  For example,
- To add a domain integrity constraint to a table, the following syntax can be used:

```
ALTER TABLE table_name
ADD CONSTRAINT constraint_name
CHECK (column_name <value>)
```

- To add a primary key constraint to a table, the following syntax can be used:

```
ALTER TABLE table_name
ADD CONSTRAINT constraint_name
PRIMARY KEY (column_name)
```

- To add a foreign key constraint to a table, the following syntax can be used:

```
ALTER TABLE table_name
ADD CONSTRAINT constraint_name
FOREIGN KEY (column_name)
REFERENCES referenced_table (referenced_column)
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. **Safety and necessary Precautions followed**

Shutdown computer system properly once the Lab hours are finished

J. **Source code / Solutions to queries :**

Practical related Quiz.

1. What is domain integrity in SQL?
   A. A set of rules that ensure that each row in a table is unique.
   B. A set of rules that ensure that each column in a table has a valid data type and range of values.
   C. A set of rules that ensure that each table in a database is linked to other tables in a consistent manner.
   D. A set of rules that ensure that each table in a database has a primary key.

2. What is entity integrity in SQL?
   A. A set of rules that ensure that each row in a table is unique.
   B. A set of rules that ensure that each column in a table has a valid data type and range of values.
   C. A set of rules that ensure that each table in a database is linked to other tables in a consistent manner.
   D. A set of rules that ensure that each table in a database has a primary key.

3. What is referential integrity in SQL?
   A. A set of rules that ensure that each row in a table is unique.
   B. A set of rules that ensure that each column in a table has a valid data type and range of values.
   C. A set of rules that ensure that each table in a database is linked to other tables in a consistent manner.
   D. A set of rules that ensure that each table in a database has a primary key.

4. Which constraint is used to ensure that a column in a table is linked to a primary key column in another table?
   A. NOT NULL constraint
   B. CHECK constraint
   C. UNIQUE constraint
   D. FOREIGN KEY constraint
5. How do you create a FOREIGN KEY constraint in SQL?
   A. ALTER TABLE table_name ADD FOREIGN KEY (column_name) REFERENCES referenced_table_name (referenced_column_name);
   B. CREATE TABLE table_name (column_name data_type CONSTRAINT fk_constraint_name FOREIGN KEY (column_name) REFERENCES referenced_table_name (referenced_column_name));
   C. CREATE CONSTRAINT fk_constraint_name FOREIGN KEY (column_name) REFERENCES referenced_table_name (referenced_column_name);
   D. You cannot create a FOREIGN KEY constraint in SQL.

K. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

L. Assessment-Rubrics

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Sign with Date

Date: ……………

Practical No.13:

Perform various Normalization forms on any database

Sample:

1.Design an E-R diagram for a university database management system that stores information about students, courses, and faculty members. The database should allow the university to manage course schedules, student enrollment, and faculty assignments. The database should also track student grades and maintain academic records. Convert database schema of university database management system into suitable Normal form(upto 3normal form)

2. Design an E-R diagram for a library management system. The library has a collection of books, and the members can borrow books from the library. The library has multiple branches, and each branch has a different collection of books. It keeps track of books, authors, and publishers. Convert database schema of library management system into suitable Normal form(upto 3normal form)

G. Objective:

- E-R diagrams provide a high-level view of the database's purpose and requirements, ER diagrams provide a detailed view of the database's structure and relationships. Both are essential tools in database design and development
- To reduce data redundancy, minimize the possibility of data inconsistencies, and improve the performance of the database. By following the principles of normalization, you can create a database that is more organized, efficient, and easier to maintain over time.

H. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

I. **Expected Skills to be developed based on competency:**

- E-R diagramming skills can improve data modeling, problem-solving, communication, analytical, and technical skills, all of which are essential in the field of database design and management
- Ability to analyze data and identify relationships between different data points.
- Understanding of normalization rules and techniques for organizing data in a database.
- Proficiency in designing and implementing a normalized database schema to ensure data consistency and eliminate redundancies.

J. Expected Course Outcomes(Cos)

Apply various Normalization techniques

K. Practical Outcome(PRo)

- E-R diagram used in data modeling, database design, communication, maintenance, and optimization.
- Normalization can improve the efficiency, consistency, flexibility, and maintenance of a database.

L. Expected Affective domain Outcome (ADos)

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

M. **Prerequisite Theory:**

- The Entity Relational Model is a model for identifying entities to be represented in the database and representation of how those entities are related. The ER data model specifies enterprise schema that represents the overall logical structure of a database graphically.

- The Entity Relationship Diagram explains the relationship among the entities present in the database. ER models are used to model real-world objects like a person, a car, or a company and the relation between these real-world objects. In short, ER Diagram is the structural format of the database.

ER Model is used to model the logical view of the system from a data perspective which consists of these symbols:

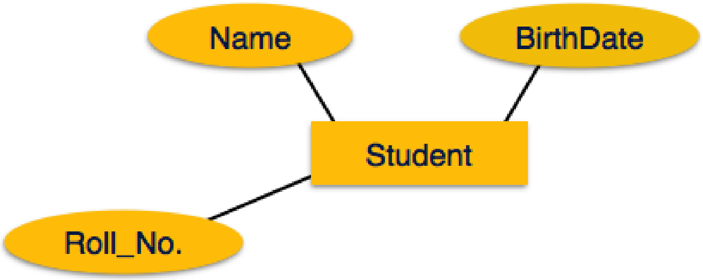
Entity

Entities are represented by means of rectangles. Rectangles are named with the entity set they represent.

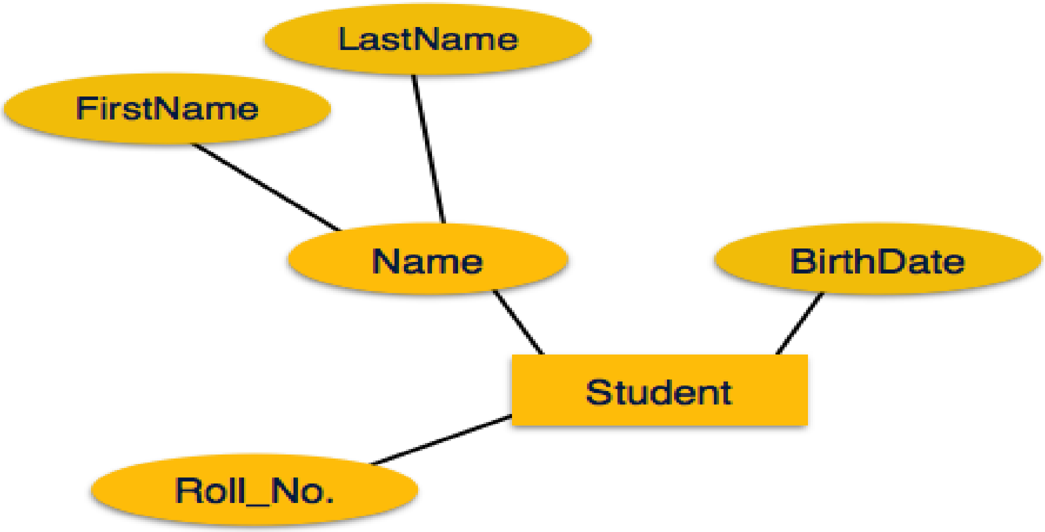
Student
Teacher
Projects

Attributes

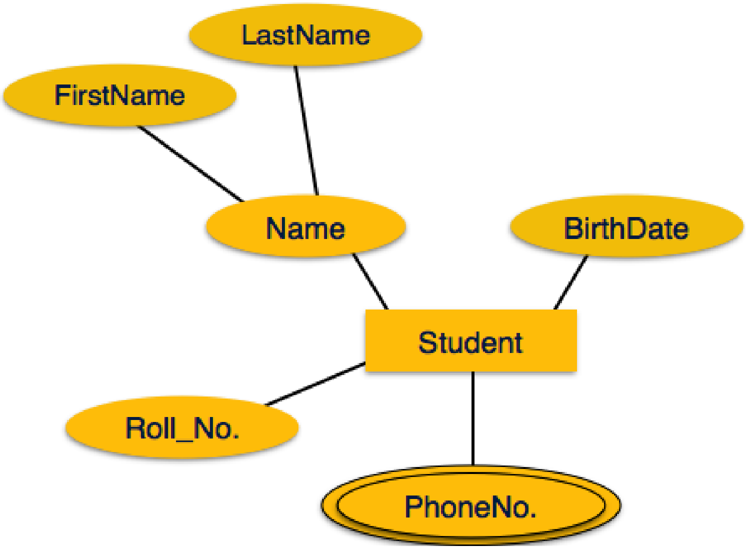
Attributes are the properties of entities. Attributes are represented by means of ellipses. Every ellipse represents one attribute and is directly connected to its entity (rectangle).



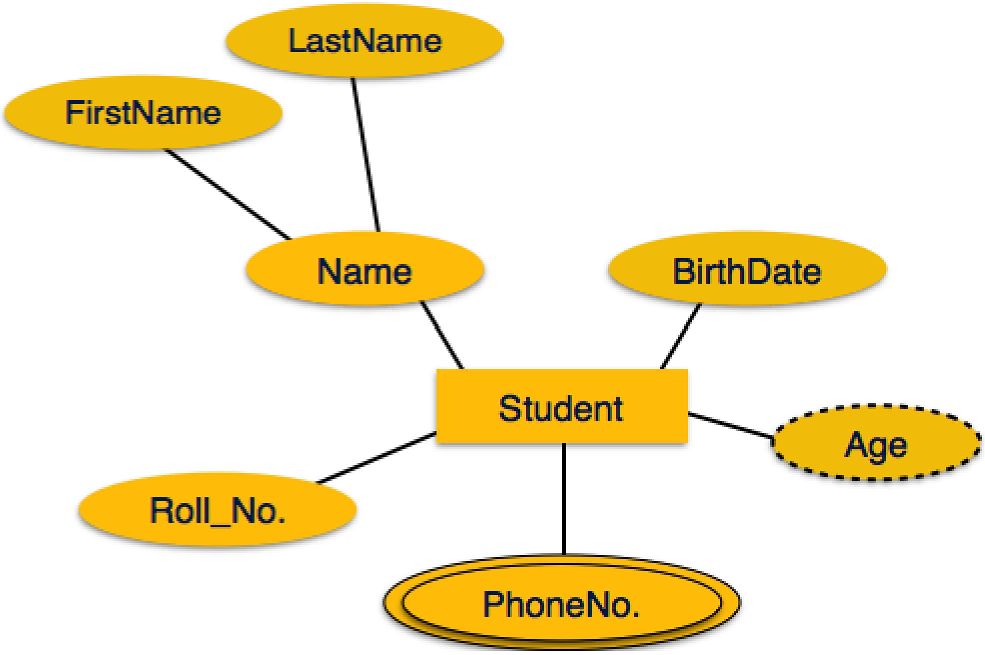
If the attributes are **composite**, they are further divided in a tree like structure. Every node is then connected to its attribute. That is, composite attributes are represented by ellipses that are connected with an ellipse.



Multivalued attributes are depicted by double ellipse.



Derived attributes are depicted by dashed ellipse.



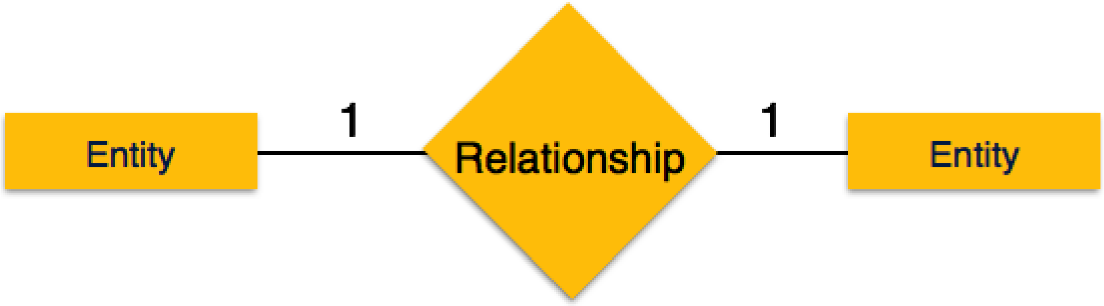
Relationship

Relationships are represented by diamond-shaped box. Name of the relationship is written inside the diamond-box. All the entities (rectangles) participating in a relationship, are connected to it by a line.

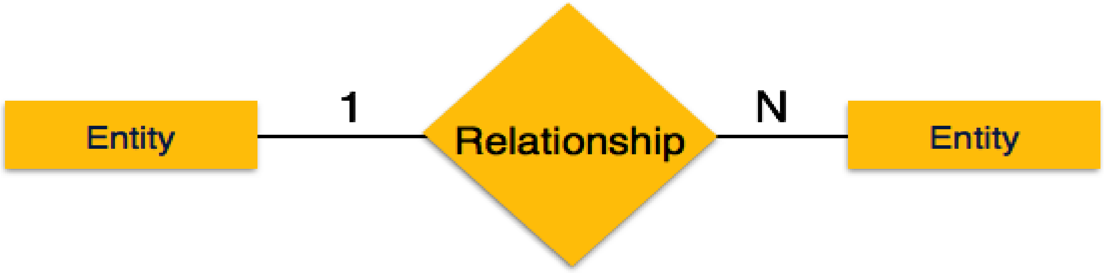
Binary Relationship and Cardinality

A relationship where two entities are participating is called a **binary relationship**. Cardinality is the number of instance of an entity from a relation that can be associated with the relation.

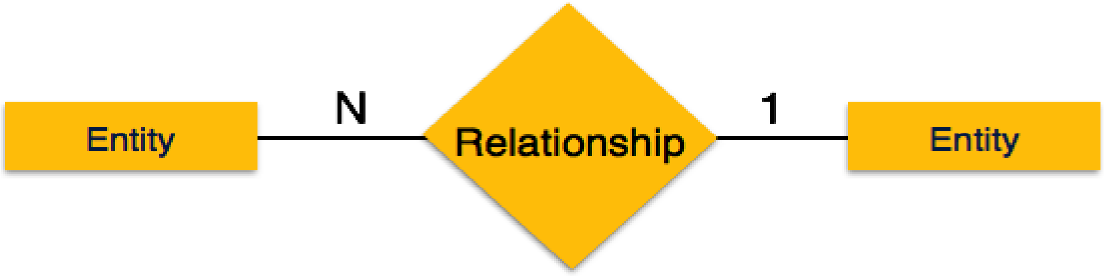
- **One-to-one** − When only one instance of an entity is associated with the relationship, it is marked as '1:1'. The following image reflects that only one instance of each entity should be associated with the relationship. It depicts one-to-one relationship.



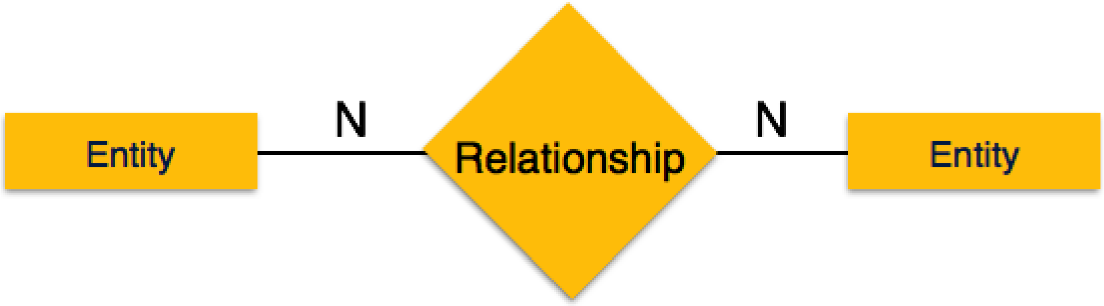
- **One-to-many** – When more than one instance of an entity is associated with a relationship, it is marked as '1:N'. The following image reflects that only one instance of entity on the left and more than one instance of an entity on the right can be associated with the relationship. It depicts one-to-many relationship.



- **Many-to-one** – When more than one instance of entity is associated with the relationship, it is marked as 'N:1'. The following image reflects that more than one instance of an entity on the left and only one instance of an entity on the right can be associated with the relationship. It depicts many-to-one relationship.



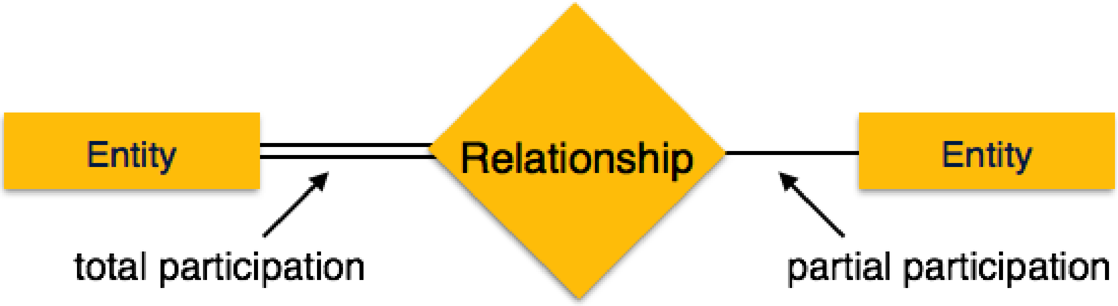
- **Many-to-many** – The following image reflects that more than one instance of an entity on the left and more than one instance of an entity on the right can be associated with the relationship. It depicts many-to-many relationship.



Participation Constraints

- **Total Participation** – Each entity is involved in the relationship. Total participation is represented by double lines.

- **Partial participation** − Not all entities are involved in the relationship. Partial participation is represented by single lines.



Normalization

- Normalization is the process of organizing the data in the database.
- Normalization is used to minimize the redundancy from a relation or set of relations. It is also used to eliminate undesirable characteristics like Insertion, Update, and Deletion Anomalies.
- Normalization divides the larger table into smaller and links them using relationships.
- The normal form is used to reduce redundancy from the database table.

The main reason for normalizing the relations is removing these anomalies. Failure to eliminate anomalies leads to data redundancy and can cause data integrity and other problems as the database grows. Normalization consists of a series of guidelines that helps to guide you in creating a good database structure.

Data modification anomalies can be categorized into three types:

- **Insertion Anomaly:** Insertion Anomaly refers to when one cannot insert a new tuple into a relationship due to lack of data.
- **Deletion Anomaly:** The delete anomaly refers to the situation where the deletion of data results in the unintended loss of some other important data.
- **Updatation Anomaly:** The update anomaly is when an update of a single data value requires multiple rows of data to be updated.

Types of Normal Forms:

Normal Form	Description
1NF	A relation is in 1NF if it contains an atomic value.
2NF	A relation will be in 2NF if it is in 1NF and all non-key attributes are fully functional dependent on the primary key.
3NF	A relation will be in 3NF if it is in 2NF and no transition dependency exists.
BCNF	A stronger definition of 3NF is known as Boyce Codd's normal form.
4NF	A relation will be in 4NF if it is in Boyce Codd's normal form and has no multi-valued

	dependency.
5NF	A relation is in 5NF. If it is in 4NF and does not contain any join dependency, joining should be lossless.

N. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

O. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

P. **Solution**

Q. Practical related Quiz.

1. What is an E-R diagram?
   A. A diagram that shows the relationships between tables in a database.
   B. A diagram that shows the relationships between entities in a system.
   C. A diagram that shows the relationships between data types in a programming language.
   D. None of the above.

2. What is an entity in an E-R diagram?
   A. A table in a database.
   B. A column in a table.
   C. A person, place, thing, or event in a system.
   D. None of the above.

3. What is a relationship in an E-R diagram?
   A. A connection between two tables in a database.
   B. A connection between two columns in a table.
   C. A connection between two entities in a system.
   D. None of the above.

4. What is normalization in database design?
   A. The process of organizing data into tables to minimize redundancy and ensure data integrity.
   B. The process of organizing tables into databases to minimize redundancy and ensure data integrity.
   C. The process of optimizing database performance by creating indexes and views.
   D. None of the above.

5. What is the purpose of normal forms in database design?
   A. To ensure that data is stored in the most efficient way possible.
   B. To ensure that data is stored in a way that is easy to query and maintain.
   C. To ensure that data is stored in a way that is free from errors and inconsistencies.
   D. All of the above.

6. What is first normal form (1NF)?
   A. A table is in 1NF if it has a primary key and all its columns are atomic.
   B. A table is in 1NF if it has a primary key and all its columns are of the same data type.
   C. A table is in 1NF if it has a primary key and all its columns are unique.
   D. None of the above.

7. What is second normal form (2NF)?

A. A table is in 2NF if it is in 1NF and all its non-key columns are fully dependent on the primary key.
B. A table is in 2NF if it is in 1NF and all its columns are of the same data type.
C. A table is in 2NF if it is in 1NF and all its columns are unique.
D. None of the above.

8. What is third normal form (3NF)?
A. A table is in 3NF if it is in 2NF and all its non-key columns are non-transitively dependent on the primary key.
B. A table is in 3NF if it is in 2NF and all its columns are of the same data type.
C. A table is in 3NF if it is in 2NF and all its columns are unique.
D. None of the above.

R. References / Suggestions

https://www.geeksforgeeks.org/ddl-commands-syntax/
https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

S. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date

Date: ……………

Practical No.14:

Perfom TCL and DCL commands table created in Practical 3.

A. Objective:

- TCL commands are used to manage transactions in SQL databases,to commit a transaction and permanently save the changes made during the transaction and to roll back a transaction and undo any changes made during the transaction
- DCL commands are used to manage user permissions and access to the database, to grant or revoke privileges to users or roles for specific database objects

, to create or drop user accounts and manage user authentication

B. Expected Program Outcomes (POs):

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the Computer Engineering problems.

2. Problem analysis: Identify and analyse well-defined Computer Engineering problems using codified standard methods.

3. Design/development of solutions: Design solutions for Computer Engineering well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. Engineering Tools, Experimentation and Testing: Apply modern Computer Engineering tools and appropriate technique to conduct standard tests and measurements.

5. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes in field of engineering.

C. Expected Skills to be developed based on competency:

Compilation, debugging, executing SQL queries

D. Expected Course Outcomes(Cos)

Perform queries on datasets using SQL*Plus

E. Practical Outcome(PRo)

Write data definition queries , compilation, debugging, executing using SQL

F. Expected Affective domain Outcome (ADos)

- Follow safety practices.

- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment
- Follow ethical practices.

G. **Prerequisite Theory:**

- ORACLE installation
- Syntax of DDL Commands

TCL Commands in SQL- Transaction Control Language Examples:

Transaction Control Language can be defined as the portion of a database language used for maintaining consistency of the database and managing transactions in database. A set of SQL statements that are co-related logically and executed on the data stored in the table is known as transaction. In this tutorial, you will learn different TCL Commands in SQL with examples and difference between them.

2. Commit Command
3. Rollback Command
4. Savepoint Command

Commit Commands:

The main use of Commit command is to make the changes done by the transaction permanent in the database.

Syntax: COMMIT;

Example:

UPDATE STUDENT SET STUDENT_NAME = 'Maria' WHERE STUDENT_NAME = 'Meena';

COMMIT;

By using the above set of instructions, you can update the wrong student name by the correct one and save it permanently in the database. The update transaction gets completed when commit is used. If commit is not used, then there will be lock on 'Meena' record till the rollback or commit is issued.

Now have a look at the below diagram where 'Meena' is updated and there is a lock on her record. The updated value is permanently saved in the database after the use of commit and lock is released.

Student ID	Student Name
78	Jane
79	Meena

After Update :

Student ID	Student Name
78	Jane
79	Maria

After Commit :

Student ID	Student Name
78	Jane
79	Maria

Rollback:

Using this command, the database can be restored to the last committed state. Additionally, it is also used with savepoint command for jumping to a savepoint in a transaction.

Syntax:

ROLLBACK;

OR

ROLLBACK TO SAVEPOINT_NAME;

Example:

UPDATE STUDENT SET STUDENT_NAME = ‘Manish’ WHERE STUDENT_NAME = ‘Meena’;

ROLLBACK;

This command is used when the user realizes that he/she has updated the wrong information and wants to undo this update. The users can issue ROLLBACK command and then undo the update. Have a look at the below tables to know better about the implementation of this command.

Student ID	Student Name
78	Jane
79	Meena

After Update :

Student ID	Student Name
78	Jane
79	Manish

After Rollback:

Student ID	Student Name
78	Jane
79	Meena

Savepoint:

The main use of the Savepoint command is to save a transaction temporarily. This way users can rollback to the point whenever it is needed.

Syntax: *SAVEPOINT SAVEPOINT_NAME;*

Example:

```
SAVEPOINT SAVEPOINT_NAME;
```

Following is the table of a school class

ID	Name
98	Anita
99	Maria
100	Katilyn

Use some SQL queries on the above table and then watch the results

```
INSERT into CLASS VALUES (101, ‘Rahul);
Commit;
UPDATE CLASS SET NAME= ‘Tyler’ where id= 101;
SAVEPOINT A;
INSERT INTO CLASS VALUES (102, ‘Zack’);
Savepoint B;
INSERT INTO CLASS VALUES (103, ‘Bruno’)
Savepoint C;
SELECT * FROM CLASS;
```

The result will look like

ID	Name
98	Anita
99	Maria
100	Katilyn
101	Tyler
102	Zack
103	Bruno

Now rollback to savepoint B

```
ROLLBACK TO B;
SELECT * FROM CLASS;
```

ID	Name
98	Anita
99	Maria
100	Katilyn
101	Tyler
102	Zack

Now rollback to savepoint A

```
ROLLBACK TO A;
SELECT * FROM CLASS;
```

ID	Name
98	Anita
99	Maria
100	Katilyn
101	Tyler

DCL Commands

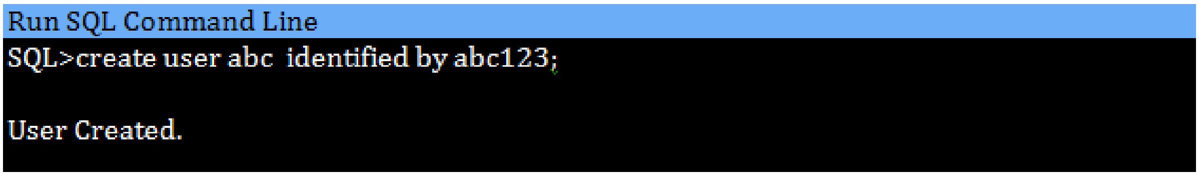
Create user –

If a login ID does not exist, it has to be created manually. The following steps indicate how a DBA login ID is created and appropriate privileges given to the DBA login ID with a special focus on creating table space.

Creating a User:-

SYNTAX: - CREATE USER USERNAME IDENTIFIED BY PASSWORD;

Example:-



```
Run SQL Command Line
SQL>create user abc  identified by abc123;

User Created.
```

When we create a user in SQL, it is not even allowed to login and create a session until and unless proper permissions/privileges are granted to the user.

Following command can be used to grant the session creating privileges.

SYNTAX: -
GRANT CREATE SESSION, connect, resource TO username;

Unlocking a user account:-

SYNTAX: - ALTER USER account IDENTIFIED BY password ACCOUNT UNLOCK;

DCL Commands

Oracle provides two commands - GRANT and REVOKE - to control the access of various database objects.

GRANT COMMAND

Grants a privilege to a user. It means that giving authority to other user by administrator. If you are an administrator then only you have the authority for granting the privilege to other users. User can grant privilege only if user has been granted that privilege

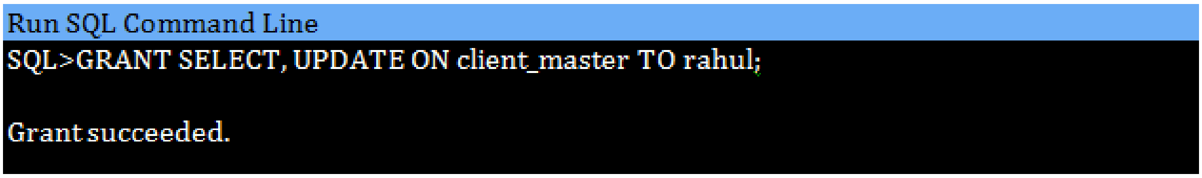
Syntax : GRANT < OBJECT PRIVILEGES > ON <OBJECTNAME> TO <USERNAME> [WITH GRANT OPTION];

OBJECT PRIVILEGES

Each object privilege that is granted authorizes the grantee to perform some operation on the object. A user can grant all the privileges or grant only specific object privileges.

The list of object privileges is as follows:
ALTER: Allows the grantee to change the table definition with the ALTER TABLE command
DELETE: Allows the grantee to remove the records from the table with the DELETE command
INDEX: Allows the grantee to create an index on the table with the CREATE INDEX command
INSERT: Allows the grantee to add records to the table with the INSERT command
SELECT: Allows the grantee to query the table with the SELECT command
UPDATE: Allows the grantee to modify the records in the tables with the UPDATE command

Example:
Give the user rahul permission to only view and modify records in the table client_master.



Run SQL Command Line

```
SQL>GRANT SELECT, UPDATE ON client_master TO rahul;

Grant succeeded.
```

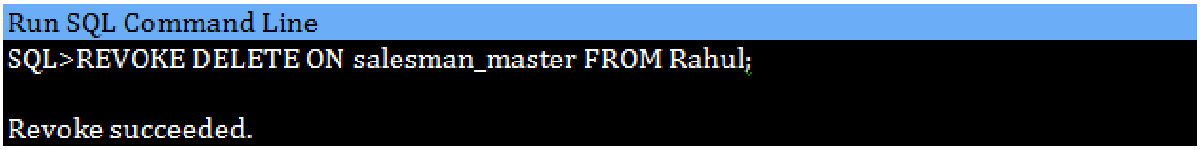
REVOKE COMMAND

The REVOKE statement is used to deny the grant given on an object. Revokes a privilege from a user. It is used in getting back authority from user.

Syntax: REVOKE < OBJECT PRIVILEGES > ON <OBJECT NAME> FROM <USERNAME>;

Example:

All privileges on the table salesman_master have been granted to rahul. Take back the Delete privilege on the table.



Run SQL Command Line

```
SQL>REVOKE DELETE ON salesman_master FROM Rahul;

Revoke succeeded.
```

H. Resources/Equipment Required

Computer or laptop with a database management system (DBMS) software installed, such as Oracle

I. Safety and necessary Precautions followed

Shutdown computer system properly once the Lab hours are finished

J. Source code / Solutions to queries:

K. Practical related Quiz.

1. Command that comes under DCL is/are -

A. GRANT
B. REVOKE
C. Both A. and B.
D. None of the above

2. Following the completion of a transaction, it must be executed to save all the operations performed in the transaction. Here we are talking about which command?

A. REVOKE
B. COMMIT
C. ROLLBACK
D. SAVE

3. Difference between GRAND & REVOKE command is/are?

L. The GRANT command can be used to grant a user access to databases and tables whereas The REVOKE command can be used to revoke all access privileges already assigned to the user.
M. The REVOKE command can be used to grant a user access to databases and tables whereas The GRANT command can be used to revoke all access privileges already assigned to the user.
N. A transaction can be rolled back to its last saved state.
O. None of the above

5. Which of the following is TRUE about TCL?

A. Transactions can be saved to the database and rolled back with the help of TCL commands in SQL.
B. There will be certain privileges that each user has; consequently, the data can be accessed by them using TCL.
C. Our data is stored in a table that is described by the schema, thus TCL commands deal with the schema.
D. SQL TCL commands can be used to perform any kind of retrieval or manipulation of the data present in SQL tables.

5. _________commands in SQL allow controlling access to data within database.

A. Database
B. Data
C. Data control
D. All of the Mentioned

L. References / Suggestions (lab manual designer should give)

https://www.geeksforgeeks.org/ddl-commands-syntax/

https://www.w3schools.com/sql/
https://www.tutorialspoint.com/sql/index.htm

M. Assessment-Rubrics

Excellent (18-20 Marks)	Good (13-17 Marks)	Satisfactory (7-12 Marks)	Fair (0-6 Marks)
• Student executes the queries with correct output. • Student submits the lab report in specified time limit.	• Student executes the queries having correct output with external guidance. • Student submits the lab report in specified time limit.	• Student executes the queries with incorrect output. • Student submits the lab report in specified time limit.	• Student is not able to execute the queries. • Student does not submit the lab report in specified time limit.

Sign with Date