Mahatma Gandhi Charitable Trust Managed

Shri Labhubhai Trivedi Institute of Engineering & Technology

CREATING CREATORS - SLTIET

Relational Database Management Systems

RDBMS - Subject Code: 4330702

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Unit - 1

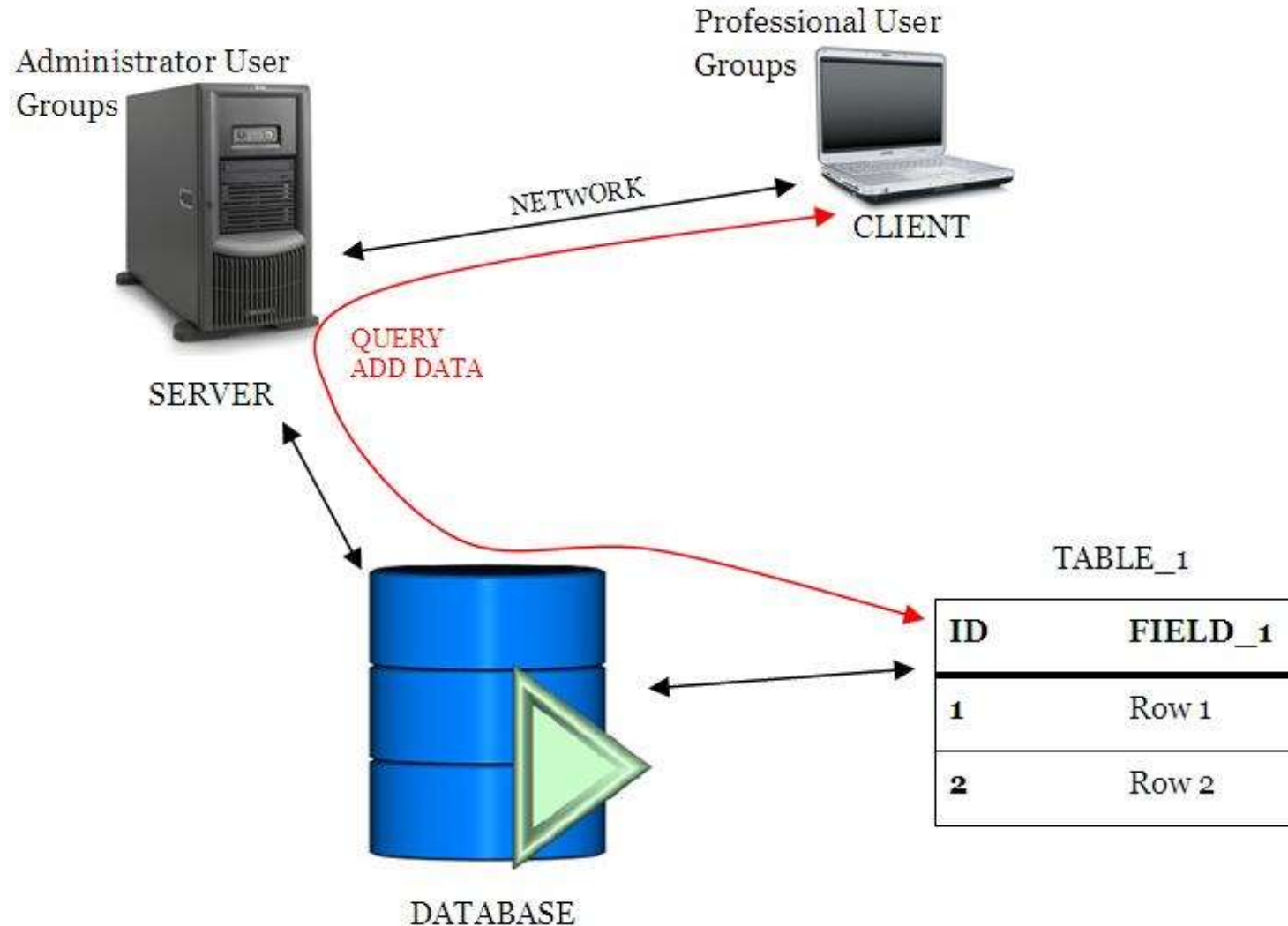# Introduction to Database System
and SQL Commands

Sub Topics:

1.1 Concepts and definition

1.2 Database related definition

1.3 Schemas and Instances

1.4 Data Types

1.5 Database Language Commands

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1.1 Concepts and definitions

What is Database?

Database

- A database is a collection of inter-related (logically-related) data.
- E.g. Books database in library, Student database in university etc.

Database Systems

- A database Management Systems is a collection of inter-related data and set of programs to manipulate those data.
- **DBMS = Database + Set of programs**
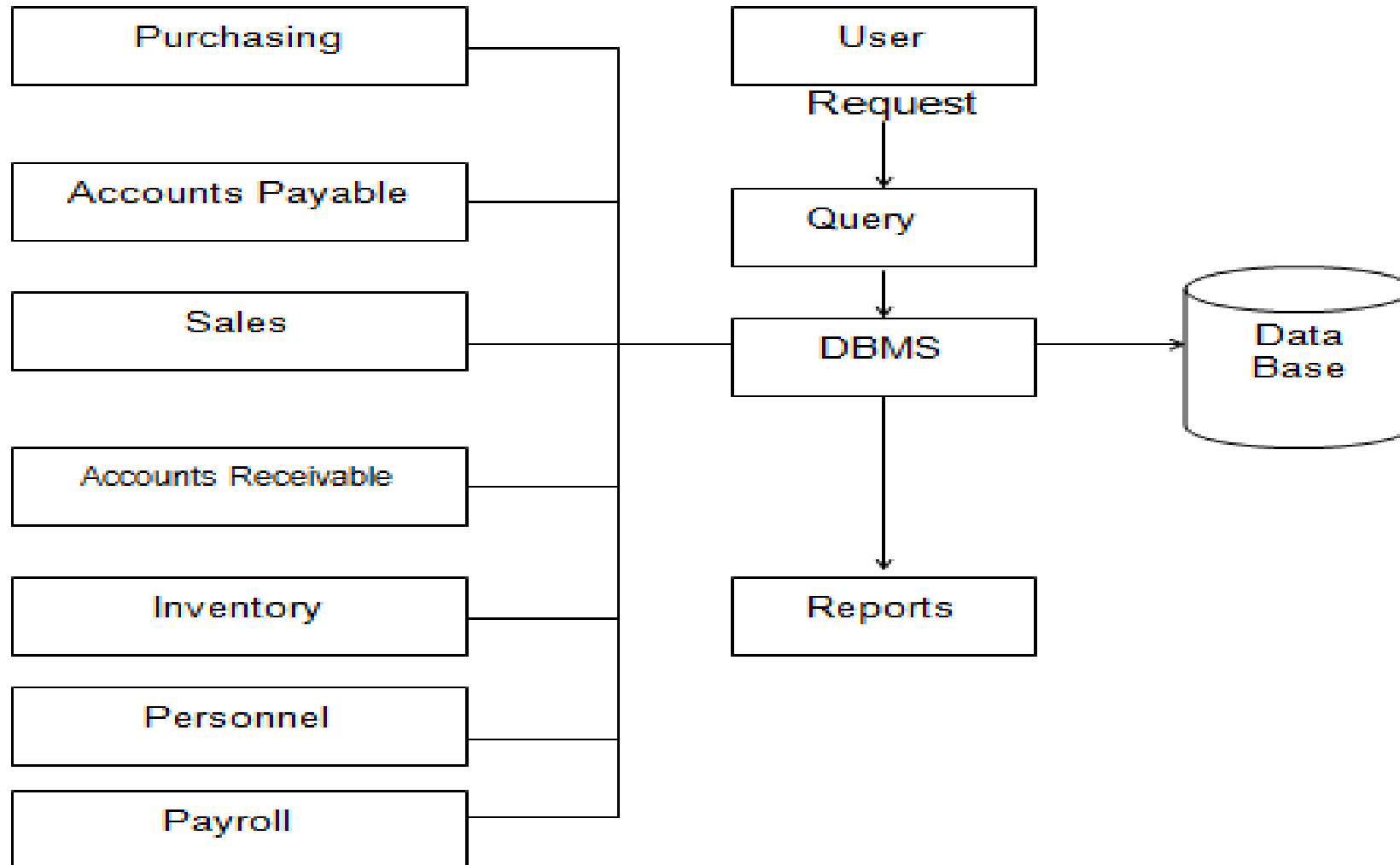- E.g. MS SQL Server, Oracle, My SQL etc.

What is Database?

Database Environment

- A database environment is a collective system of components that comprise and regulates the group of data and use of data which consist of software, hardware, people, techniques of handling database, and the data also.

Diagram of Database

1.2 Database related definition

Data

- "DATA is a raw fact, anything can be data".

- Data is basic row material which taken by certain observation, certain experiment and storing in paper, stored memory, human mind.

- Ex:- marks of student ,account information

Information

- This is a processed form of the data.

- It is always meaningful.

- "Meaningful data is called information".

Continue…

Data	Information
Data means knows facts that can be recorded and have implicit meanings.	Information means processed or organized data.
Example : Student name, City Name, Branch, Semester	Example : Percentage (derived from processing marks)
Data are raw materials used to derive information.	Information is a product derived from data.
Data is comparatively less helpful.	Information is comparatively more helpful.

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Continue…

Data Item or Fields

- A field is a character or group of characters that have a specific meaning.
- It is also called a data item. It is represented in the database by a value.
- For Example, the value of Emp_Name, Address, Mobile_No. etc. All are fields of faculty table.

Emp_Name	Mobile No.	Subject	Address
Prof. Ashok Mehta	8563214795	RDBMS	Rajkot
Prof. Vivek Maru	6354789541	OS	Rajkot

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Continue…

Fields

Prof. Ashok Mehta	8563214795	Rajkot

Records/ Tuples

- A record is a collection of logically related fields. For example, collection of fields (id, name, society & city) forms a record for customers.

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Files

● A group of related records. Files are frequently classified by the application for which they are primarily used (employee file).

MetaData

● Metadata is data about data.
● Data such as table name, column name, data type, authorized user and user access privileges for any table is called metadata for that table.

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Continue…

Example : Employee

e_no	name	salary
101	Roshani	5000
102	Geeta	7000

(a) Data

Name	Type	Size
e_no	num	5
name	varchar	30
salary	num	7

(b) Metadata

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Continue…

Data Dictionary and it's Components

- A data dictionary contains metadata. The data dictionary is very important as it contains information such as what is in the database, who is allowed to access it, where is the database physically stored etc.

Continue…

Field Name	Data Type	Field Size for display	Description	Example
Employee Number	Integer	10	Unique ID of each employee	1645000001
Name	Text	20	Name of the employee	David Heston
Date of Birth	Date/Time	10	DOB of employee	08/03/1995
Phone Number	Integer	10	Phone Number of employee	6583648648

Continue…

Data dictionary components are –

❖ <u>Active Data Dictionary</u>

The data dictionary is automatically updated by the database management system when any changes are made in the database. This is known as an active data dictionary as it is self updating.

❖ <u>Passive Data Dictionary</u>

The passive data dictionary has to be manually updated to match the database. This needs careful handling the database.

1.3 Schemas

- The plan/formulation or overall design of database is known as schema.
- Schema gives the names of the entities and attributes. It specifies relationship among them.
- Database Schema = Variable Declaration
- Schemas does not change frequently.

Example: Table Name : Account

| Name	Type	Size	Constraints
Acc_No.	CHAR	3	Primary Key
Balance	NUMBER	9	Not Null
Bank_Name	VARCHAR2	10	Not Null

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Continue…

Schema can be categorized in two ways:

1) Logical schema : The schema defines all the logical constraints that need to be applied on the data stored. It define Table, View and integrity constraints.

2) Physical Schema : This schema is to the actual storage of data and its form of storage like files. It defines how the data will be stored in Secondary storage.

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Schemas:
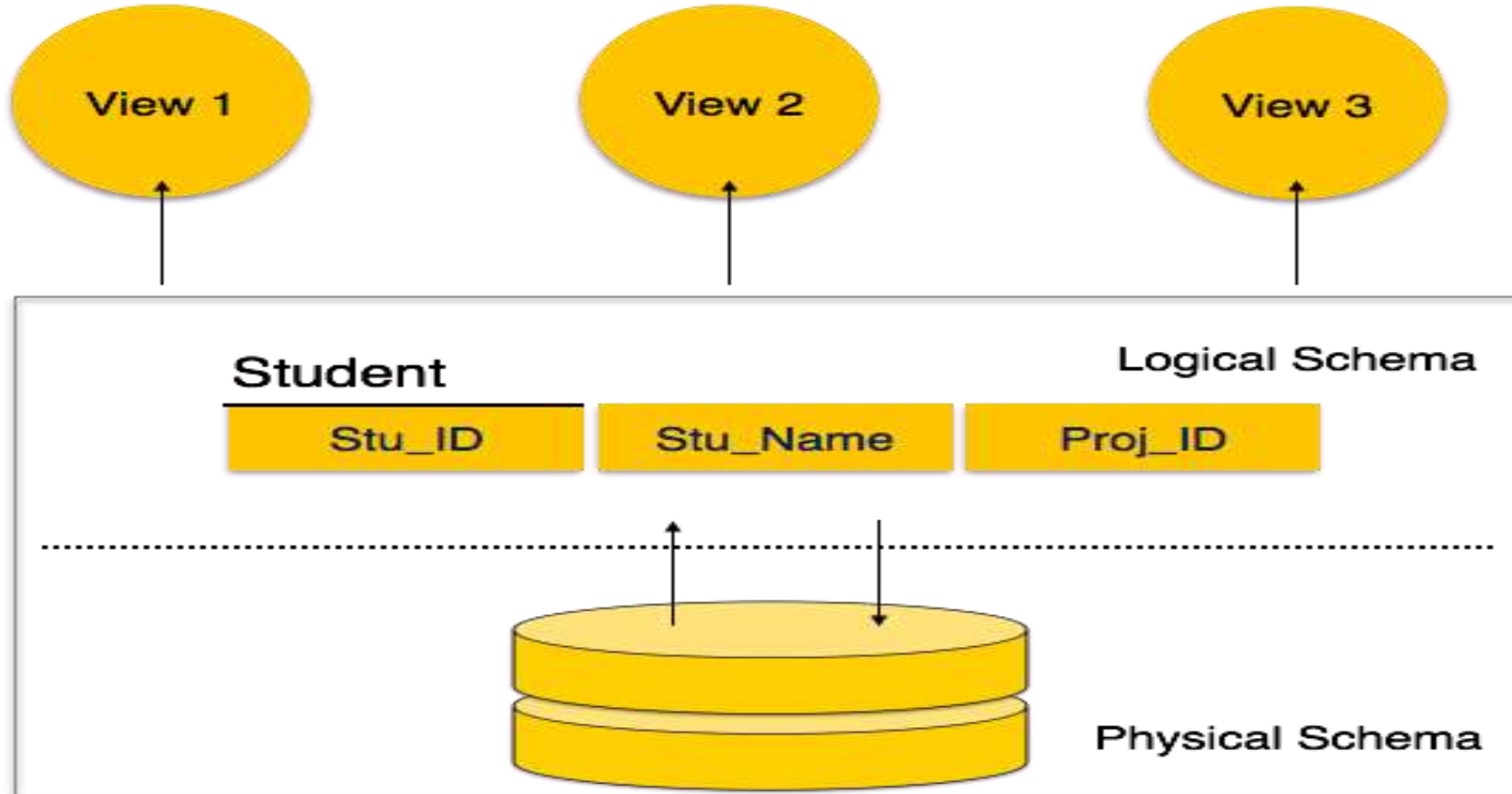
Instances

Instances

- The collection of information stored at a particular moment.
- Database Instances = Value of the variable
- Instances change frequently.

Example :   Table Name : Account

Acc_No	Balance	Bank_Name
A01	5000	BOB
A02	8000	Axis
A03	20000	ICICI

1.4 Data Types

SQL data type can be divided into different categories as given below :

1) Numerical Data type

2) Character/String Data type

3) Date Data type

4) Binary Data type

Continue…

1) Numerical Data Types :

No.	Data Type	Represent
1	NUMBER (P,S)	- Floating - point number - P : Precision - i.e. the maximum number of digits in a number. It can be up to 38 digits. - S : Scale - i.e. number of digits to the right of the decimal point
2	NUMBER (P)	- Fixed-point (whole)number with a scale of zero and precision of P.
3	NUMBER	- Floating-point number with a precision of 38.

Continue…

2) Character/String Data Types :

No.	Data Type	Represent
1	CHAR (size)	- store character string of fixed length - size represent the no. of characters(length) to be stored.The default size is 1. - The maximum length is 255 characters.
2	VARCHAR (size)/ VARCHAR2(size)	- store character string of variable length - more flexible than CHAR
3	LONG	- store large amount of character strings of variable length. - the maximum length is up to 2 GB.

Continue…

3) Date Data Types :

- Used to store date and time.

- The information stored about date and time is century, year, month, day, hour, minute and second.

- The standard format is DD-MON-YY to store date such as 01-APR-07.

- Current date and time can be retrieved using SYSDATE function.

- If time portion is not specified, the default time is 12:00:00 a.m.

4) Binary Data Types :

No.	Data Type	Represent
1	RAW	- store binary type data. - the max. length is up to 255 bytes
2	LONG RAW	- store large amount of binary type data - the max. length is up to 2 GB - A LONG RAW column cannot be indexed

1.5 Database Language Commands
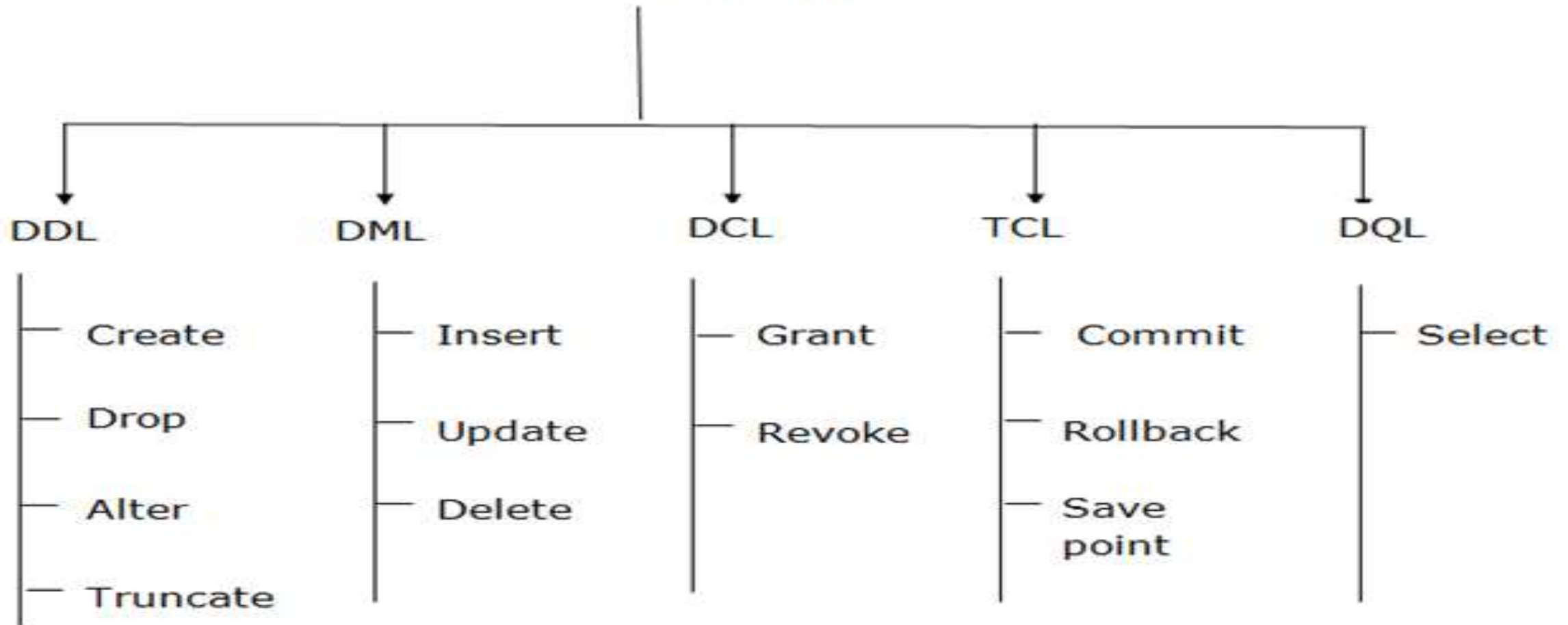
1) DDL – Data Definition Language

❖ **Create : It used to create table.**

Syntax: CREATE TABLE TableName (column1 datatype(size), column2

datatype(size)...ColumnN datatype(size));

Example:

Input :   CREATE TABLE student(Rollno number(15),

Name varchar2(20),

Age number(5),

DOB date);

Continue…

Output :

Table Created.

Input : Select * from student;

Output :

Rollno.	Name	Age	DOB

Continue…

❖ **Alter: It used to modify table structure.**

a) Adding New Columns

Syntax: Alter Table TableName Add (NewColumnName1 Datatype (size), NewColumnName2 Datatype (size)…. NewColumnNameN Datatype (size));

Example: ALTER TABLE student ADD (Marks number (15)); //Add column marks

Rollno.	Name	Age	DOB	Marks

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Continue…

b) Modifying Existing Columns

Syntax: Alter Table TableName Modify (ColumnName1 NewDatatype (NewSize), ColumnName2 NewDatatype (NewSize)……ColumnNameN NewDatatype (NewSize));

Example: ALTER TABLE student Modify (Marks number (20)); // Change size of column

Rollno.	Name	Age	DOB	Marks

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Continue…

c) Dropping Existing Columns

Syntax: Alter Table TableName DROP COLUMN ColumnName1, ColumnName2;

Example: ALTER TABLE student DROP COLUMN Marks; // Remove marks column

Rollno.	Name	Age	DOB

Continue…

❖ **Drop: It is used to delete or destroy table from a database.**

Syntax: DROP TABLE TableName

Example: DROP TABLE student;

Continue…

❖ **Truncate:**

- TRUNCATE TABLE used to delete all data from a table
- Logically, this is equivalent to DELETE statement that deletes all rows
- TRUNCATE command is faster than DELETE command
- The number of deleted rows are not returned

Syntax: TRUNCATE TABLE TableName;

Example: TRUNCATE TABLE student;

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2) DQL – Data Query Language

❖ **Select: The SELECT command is used to retrieve selected rows from the Tables.**

1) All rows and all columns
2) All rows and selected columns
3) Selected rows and all columns
4) Selected rows and selected columns

Continue...

Syntax:

A. SELECT * FROM TableName;
B. SELECT ColumnName1, ColumnName2… ColumnNameN From TableName;
C. SELECT * FROM TableName WHERE Condition;
D. SELECT ColumnName1, ColumnName2… ColumnNameN From TableName WHERE Condition;

Example :

A. SELECT * FROM student;
B. SELECT Rollno, Name FROM student;
C. SELECT * FROM student where Rollno=101;
D. SELECT Rollno, Name FROM student where Rollno=101;

3) DML – Data Manipulation Language

❖ **Insert : The INSERT Statement is used to add new rows of data to a table.**

Syntax: INSERT INTO TableName(ColumnName1, ColumnName2...ColumnNameN) values (Expression1, Expression2....ExpressionN);

Example:

Input : INSERT INTO Student (Sno, Sname, Age, Branch)
        values (3,'xyz', 17,'CSE');

-> We can insert NULL value in Table Using INSERT Statement.
INSERT INTO Student (Sno, Sname, age, Branch) values (3,'xyz', 17, NULL);

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Output :

Sno	Sname	Age	Branch
1	abc	17	cse
2	pqr	18	civil
3	xyz	17	cse

Continue…

❖ **Update :The UPDATE Statement is used to modify the existing rows in a table.**

Syntax: UPDATE TableName SET Column_Name1 = value1, Column_Name2 = value2 WHERE condition;

Example: UPDATE Student SET SName='Rahul' WHERE Sno=1;

NOTE:

- In the Update statement, WHERE clause identifies the rows that get affected.
- If you do not include the WHERE clause, column values for all the rows get affected.

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Continue…

Output :

Sno	Sname	Age	Branch
1	Rahul	17	cse
2	pqr	18	civil
3	xyz	17	cse

Continue…

❖ **Delete : The DELETE Statement is used to delete rows from a table.**

Syntax: DELETE FROM TableName WHERE condition;

Example:

● To delete an employee with id 100 from the employee table, the SQL delete query would be like,

DELETE FROM Student WHERE Sno = 3;

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Continue…

Output :

Sno	Sname	Age	Branch
1	Rahul	17	cse
2	pqr	18	civil

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4) TCL – Transactional Control Language

TCL commands are used to manage transactions, that are given below:
- Commit
- Rollback
- Savepoint

a) Commit : Committing a Transaction

●There are two ways to commit a transaction:
  - Explicitly
  - Implicitly

Continue…

Explicit Commit:
- To commit a transaction explicitly, user needs to request COMMIT command explicitly.
- A COMMIT command terminates the current transaction and makes all the changes permanent.
- Various data manipulation operations such as insert, update and delete are not effect permanently until they are committed.

Implicit Commit:
- There are some operations which forces a COMMIT to occur automatically, even user don't specify the COMMIT command.

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Continue…

b) Rollback : Canceling a Transaction Completely

- A transaction can be canceled using the ROLLBACK command either completely or partially.
- A ROLLBACK command terminates the current transaction and not done any changes made during the transaction.

Syntax :

ROLLBACK;

Output:

Rollback complete

Continue…

c) Savepoint: Canceling a Transaction Partially

- A ROLLBACK command can also be used to terminate the current transaction partially.

  Syntax: ROLLBACK TO SAVEPOINT savepoint_name;

  Output: Rollback compete.

Continue…

- It is required to create a savepoint to cancel transaction partially.

- A savepoint marks and save the current point in the processing of a transaction.

- A savepoint can be created using command SAVEPOINT as given below:

  Syntax: SAVEPOINT savepoint_name;

  Output: Savepoint created.

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Example :

e_name	salary
Rohan	100
Sima	500
Koyal	400

Continue…

Input:

Update employee

Set e_name = 'Rima'

where e_name = 'Sima';

commit;

rollback;

Output :

After commit performed :

e_name	salary
Rohan	100
Rima	500
Koyal	400

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Continue…

Input:

Update employee

Set e_name = 'Rima'

where e_name = 'Sima';

commit;

rollback;

Output :

If commit not performed and

rollback performed :

e_name	salary
Rohan	100
Sima	500
Koyal	400

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Continue…

Input:

Insert into employee (e_name, salary)
value('Diya', 700);

commit;

Update employee
Set e_name = 'Meera'
where salary = 400;

savepoint A;

Continue…

Insert into employee (e_name, salary) value('Jack', 550);

savepoint B;

Insert into employee (e_name, salary) value('Jony', 350);

savepoint C;

Select * from employee;

Output :

e_name	salary
Rohan	100
Sima	500
Meera	400
Diya	**700**
Jack	**550**
Jony	**350**

Continue…

Input :

rollback to B;

Output :

e_name	salary
Rohan	100
Sima	500
Meera	400
Diya	700
Jack	550

Continue…

Input :

rollback to A ;

Output :

e_name	salary
Rohan	100
Sima	500
Meera	400
Diya	700

5) DCL– Data Control Language

a) Grant : Granting Privileges

- GRANT command is used to give permission some user to access database object or a part of a database object.
- This command provides various types of access to database object such as tables, views and sequences.

Syntax: GRANT object privileges

　　　　ON object name

　　　　TO user name [WITH GRANT OPTION];

Example: GRANT ALL

　　　　ON Customer

　　　　TO user2 WITH GRANT OPTION;

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Continue…

b) Revoke : Revoking Privileges

● Revoking privileges means to deny (decline) permission to user given previously.

Syntax: REVOKE object privileges
         ON object name
         FROM user name;

Example: Revoke SELECT, INSERT
         ON Customer
         FROM user2;

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Difference

GRANT	REVOKE
This DCL command grants permissions to the user on the database objects.	This DCL command removes permissions if any granted to the users on database objects.
It assigns access rights to users.	It revokes the user access rights of users.
For each user you need to specify the permissions.	If access for one user is removed; all the particular permissions provided by users to others will be removed.
When the access is decentralized granting permissions will be easy.	If decentralized access, removing the granted permissions is difficult.

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Questions

1) Define following terms.
   a. Data
   b. Information
   c. Database
   d. Database system
   e. Metadata
   f. Files
   g. Records
   h. Schema
   i. Sub schema
   j. Instance

Questions

2) Explain DDL or DCL or TCL or DML Command with Example.
3) Difference between Delete v/s Drop.
4) Explain Schemas and Instances with example.
5) Write about Datatypes of SQL.
6) Difference between Grant v/s Revoke.
7) Explain Save point concept.

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