Logo, company name

Description automatically generated

Database

Tesfaye Abriha July 2022

Lab Guide

**Short Answer**

1. what is Data?

Ans*: Data is any piece of information about people, places or things. It is a collection of facts. (bloomfire.com/blog/data-vs-information/)*

1. what is Information?

*Ans: Information is an organized data. (bloomfire.com/blog/data-vs-information/)*

1. what is Database(DB)?

*Ans:  A database is a collection of data that is organized, which is also called structured data. (https://www.oracle.com/database/what-is-database)*

1. What is the Relation Database Management System (RDBMS)?

*Ans: A relational database management system (RDBMS) is, as the name suggests,**software that manages a relational database. It is a set of smaller programs designed to work together, allowing the developer to store, access, and modify data in tables, transparently and without having to know where the data is physically stored on disk.*   
*(www.vertabelo.com/blog/what-is-rdbms/)*

1. Define the importance of Relation Database Management System (RDBMS)?

*Ans: Here are 8 advantages of RDBMS:*

*(https://www.educba.com/relational-database-advantages/)*

#### 1. Simple Model

*A Relational Database system is the simplest model, as it does not require any complex structuring or querying processes. It doesn’t involve tedious architectural processes like hierarchical database structuring or definition. As the structure is simple, it is sufficient to be handled with simple SQL queries and does not require complex queries to be designed.*

#### 2. Data Accuracy

*In the relational database system, there can be multiple tables related to one another with the use of a primary key and foreign key concepts. This makes the data to be non-repetitive. There is no chance for duplication of data. Hence the accuracy of data in the relational database is more than any other database system.*

#### 3. Easy Access to Data

*In the Relational Database System, there is no pattern or pathway for accessing the data, as to another type of databases can be accessed only by navigating through a tree or a*[hierarchical model](https://www.educba.com/hierarchical-database-model/)*. Anyone who accesses the data can query any table in the relational database. Using join queries and conditional statements one can combine all or any number of related tables in order to fetch the required data. Resulting data can be modified based on the values from any column, on any number of columns, which permits the user to effortlessly recover the relevant data as the result. It allows one to pick on the desired columns to be incorporated in the outcome so that only appropriate data will be displayed.*

#### 4. Data Integrity

*Data integrity is a crucial characteristic of the Relational Database system. Sturdy Data entries and legitimacy validations ensure that all the Data in the database confines within suitable arrangements and the data necessary for creating the relationships are present. This relational reliability amongst the tables in the database helps in avoiding the records from being imperfect, isolated or unrelated. Data integrity aids in making sure of the relational database’s other significant characteristics like Ease of use, precision, and stability of the data.*

#### 5. Flexibility

*A Relational Database system by itself possesses qualities for leveling up, expanding for bigger lengths, as it is endowed with a bendable structure to accommodate the constantly shifting requirements. This facilitates the increasing incoming amount of data, as well as the update and deletes wherever required. This model consents to the changes made to a database configuration as well, which can be applied without difficulty devoid of crashing the data or the other parts of the database.*

*A*[Data Analyst](https://www.educba.com/what-is-data-analyst/)*can insert, update or delete tables, columns or individual data in the given database system promptly and easily, in order to meet the business needs. There is supposedly no boundary on the number of rows, columns or tables a relational database can hold. In any practical application, development and transformation are restricted by the Relational Database Management System and the hardware contained by the servers. So these changes can create an alteration in other peripheral functional devices connected to the particular relational database system.*

#### 6. Normalization

*The methodical style is maintained for making sure of a relational database structure is liberated of any variances that can make a difference in the integrity and accuracy of the tables in the database. A normalization process provides a set of regulations, characteristics, and purposes for the database structure and evaluation of a relational database model.*

*Normalization aims at illustrating multiple levels of breaking down the data. Any level of normalization is expected to be accomplished on the same level, that is, before moving ahead to the next levels. A relational database model is usually confirmed to be normalized, only when it satisfies the necessary conditions of the third normalization form. Normalization offers an impression of reassurance on the database plan, to be extra strong and reliable.*

#### 7. High Security

*As the data is divided amongst the tables of the relational database system, it is possible to make a few tables to be tagged as confidential and others not. This segregation is easily implemented with a relational database management system, unlike other databases. When a data analyst tries to login with a username and password, the database can set boundaries for their level of access, by providing admission only to the tables that they are allowed to work on, depending on their access level.*

#### 8. Feasible for Future Modifications

*As the relational database system holds records in separate tables based on their categories, it is straightforward to insert, delete or update records that are subjected to the latest requirements. This feature of the relational database model tolerates the newest requirements that are presented by the business. Any number of new or existing tables or columns of data can be inserted or modified depending on the conditions provided, by keeping up with the basic qualities of the relational database management system.*

1. As we all know that there are Two types of Database. Relational Database(SQL) AND Non-Relational DB (NO sql). what is the difference between

Them?

*Ans: The following are points in which the difference between Relational and Non-Relational Database Systems are pronounced: (https://www.allbluesolutions.com/blog/what-is-the-difference-between-sql-vs-nosql-databases/)*

## *Language*

*One of the crucial differences that exists between SQL relational and NoSQL non-relational databases is in terms of language.*

* *In general, SQL databases uses Structured Query Language for defining and manipulating data, and this allows SQL to be extremely versatile and widely-used and it also makes it more restrictive.*
* *SQL requires you to use predefined schemas to determine the structure of your data before you begin to work with it.*
* *On the other hand, your data also follow the same structure, which can entail significant upfront preparation along with careful execution.*

*Unlike its counterpart, a NoSQL database features a dynamic schema for unstructured data and the data can be stored in many different ways, whether it be graph-based, document-oriented, column-oriented, or organized as a Key Value store.*

*As a result, this extreme flexibility allows you to:*

* *Enables you to create documents without first having to carefully plan and define their structure*
* *Add fields as you go*
* *Vary the syntax from database to database*
* *Give each document its own unique structure, providing you with more freedom on an overall basis*

## *Scalability*

*One of the big differences between SQL and NoSQL is their scalability, and most SQL databases are vertically scalable, which means that you can increase the load on a single server by increasing components like RAM, SSD, or CPU. In contrast to SQL, whereas NoSQL databases are horizontally scalable, which means that they can handle increased traffic simply by adding more servers to the database. NoSQL databases have the ability to become larger and much more powerful, making them the preferred choice for large or constantly evolving data sets.*

## *The community*

*Due to SQL’s maturity, it has a much stronger and more developed community compared to NoSQL. There are thousands of chats and forums available where experts can share knowledge and discuss SQL best practices, continuously to enhance their technical skills. Whereas, NoSQL is growing rapidly and its community is not as well defined as SQL due to the fact that it is still relatively new in the market.*

## *Structure*

*Finally, a last thing to consider when debating SQL versus NoSQL is their structures. SQL databases are table-based which makes them a better option for applications that require multi-row transactions. Examples may be accounting systems or legacy systems that were originally built for a relational structure. Unlike its counterpart, NoSQL databases comes with key-value pairs, wide-column stores, graph databases, and mainly document-based.*

1. List examples of Relation Database Management System (RDBMS)?

*Ans:* (*https://docs.rackspace.com/support/how-to/examples-of-rdbms-and-nosql-databases/)*

*The following list describes popular SQL and RDBMS databases:*

* *Oracle®: An object-relational database management system (DBMS) written in the C++ language.*
* *IBM DB2®: A family of database server products from IBM®.*
* *SAP ASE®: A business relational database server product for primarily Unix® operating systems.*
* *Microsoft SQL Server®: An RDBMS for enterprise-level databases that supports both SQL and NoSQL architectures.*
* *Maria DB®: An enhanced, drop-in version of MySQL®.*
* *PostgreSQL®: An enterprise-level, object-relational DBMS that uses procedural languages, such as Perl and Python, in addition to SQL-level code.*

1. List examples of Non-Relational DB (Nosql)?

*Ans:* (*https://docs.rackspace.com/support/how-to/examples-of-rdbms-and-nosql-databases/)*

*The following list describes popular NoSQL databases:*

* *MongoDB®: The most popular open-source NoSQL system. MongoDB is a document-oriented database that stores JSON-like documents in dynamic schemas.*
* *Apache CouchDB®: An open-source, web-oriented database developed by Apache®. CouchDB uses the JSON data exchange format to store its documents; JavaScript for indexing, combining, and transforming documents; and HTTP for its API.*
* *Apache HBase®: An open-source Apache project developed as a part of Hadoop®. HBase is a column store database written in Java with capabilities similar to those that Google BigTable® provides.*
* *Oracle NoSQL Database®: A proprietary database that supports JSON table and key-value datatypes running on-premise or as a cloud service.*
* *Apache Cassandra DB®: A distributed database that excels at handling extremely large amounts of structured data. Cassandra DB is also highly scalable. Facebook® created Cassandra DB.*
* *Riak®: An open-source, key-value store database written in Erlang. Riak has built-in fault-tolerance replication and automatic data distribution that enable it to offer excellent performance.*
* *Objectivity InfiniteGraph®: A highly specialized graph database that focuses on graph data structures. InfiniteGraph, implemented in Java, is useful for finding hidden relationships in big data.*

1. Define and Describe is Structured Query Language (SQL)?

*Ans: (https://www.sqlcourse.com/beginner-course/what-is-sql/)*

*SQL (pronounced “ess-que-el”) stands for Structured Query Language. SQL is used to communicate with a database. According to ANSI (American National Standards Institute), it is the standard language for relational database management systems. SQL statements are used to perform tasks such as update data on a database, or retrieve data from a database. Some common relational database management systems that use SQL are: Oracle, Sybase, Microsoft SQL Server, Access, Ingres, etc.*

1. List and Describe each of the different subsets of SQL (Mean DDL, DML, DCL, TCL)?

*Ans: The following are the different subsets of SQL: (https://www.geeksforgeeks.org/sql-ddl-dql-dml-dcl-tcl-commands/)*

* + - * 1. *DDL (Data Definition Language):*

*DDL or Data Definition Language actually consists of the SQL commands that can be used to define the database schema. It simply deals with descriptions of the database schema and is used to create and modify the structure of database objects in the database. DDL is a set of SQL commands used to create, modify, and delete database structures but not data. These commands are normally not used by a general user, who should be accessing the database via an application.*

*List of DDL commands:*

* *CREATE: This command is used to create the database or its objects (like table, index, function, views, store procedure, and triggers).*
* *DROP: This command is used to delete objects from the database.*
* *ALTER: This is used to alter the structure of the database.*
* *TRUNCATE: This is used to remove all records from a table, including all spaces allocated for the records are removed.*
* *COMMENT: This is used to add comments to the data dictionary.*
* *RENAME: This is used to rename an object existing in the database.*
  + - * 1. *DQL (Data Query Language):*

*DQL statements are used for performing queries on the data within schema objects. The purpose of the DQL Command is to get some schema relation based on the query passed to it. We can define DQL as follows it is a component of SQL statement that allows getting data from the database and imposing order upon it. It includes the SELECT statement. This command allows getting the data out of the database to perform operations with it. When a SELECT is fired against a table or tables the result is compiled into a further temporary table, which is displayed or perhaps received by the program i.e. a front-end.*

*List of DQL:*

* *SELECT: It is used to retrieve data from the database.*
  + - * 1. *DML(Data Manipulation Language):*

*The SQL commands that deals with the manipulation of data present in the database belong to DML or Data Manipulation Language and this includes most of the SQL statements. It is the component of the SQL statement that controls access to data and to the database. Basically, DCL statements are grouped with DML statements.*

*List of DML commands:*

* *INSERT : It is used to insert data into a table.*
* *UPDATE: It is used to update existing data within a table.*
* *DELETE : It is used to delete records from a database table.*
* *LOCK: Table control concurrency.*
* *CALL: Call a PL/SQL or JAVA subprogram.*
* *EXPLAIN PLAN: It describes the access path to data.*
  + - * 1. *DCL (Data Control Language):*

*DCL includes commands such as GRANT and REVOKE which mainly deal with the rights, permissions, and other controls of the database system.*

*List of DCL commands:*

* *GRANT: This command gives users access privileges to the database.*
* *REVOKE: This command withdraws the user’s access privileges given by using the GRANT command.*
  + - * 1. *TCL (Transaction Control Language):*

*TCL commands deal with the transaction within the database.*

*List of TCL commands:*

* *COMMIT: Commits a Transaction.*
* *ROLLBACK: Rollbacks a transaction in case of any error occurs.*
* *SAVEPOINT:Sets a savepoint within a transaction.*
* *SET TRANSACTION: Specify characteristics for the transaction.*

11. what is table in Database (DB)?

*Ans: (https://database.guide/what-is-a-table/)*

*A database table is a structure that organizes data into*[*rows*](https://database.guide/what-is-a-row/)*and*[*columns*](https://database.guide/what-is-a-column/)*– forming a grid. Tables are similar to a worksheets in spreadsheet applications. The rows run horizontally and represent each record. The columns run vertically and represent a specific field. The rows and columns intersect, forming a grid. The intersection of the rows and columns defines each cell in the table.*

12. what is column and Row (tuples) in table?

*Ans: (https://database.guide/what-is-a-table/)*

*The rows run horizontally and represent each record. The columns run vertically and represent a specific field. The rows and columns intersect, forming a grid. The intersection of the rows and columns defines each cell in the table.*