

Chapter 14 - Database Management System

In this tutorial we will discuss the following topics

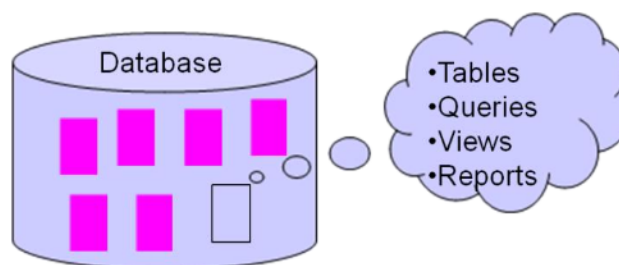
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INTRODUCTION

Database is a collection of related information that is organized in such a way that supports for easy access, modify and maintain data. The contents of a database are obtained by combining data from all the different sources in an organization.

A **database management system (DBMS)** or database system in short, is software that can be used to create and manage databases.



Examples of database management systems are: Ms-Access, MySQL, PostgreSQL, SQLite, Microsoft SQL Server, Oracle, SAP, dBase, FoxPro, etc.

Advantages of Data Base System:

1) Reduce data redundancy (duplication of data):

It removes duplication of data because data are kept at one place and all the application refers to the centrally maintained database.

2) Control data inconsistency to a large extent:

3) Database facilitate sharing of data

4) Enforce standards

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- 5) Centralized databases can ensure data security
- 6) The DBMS serves as an interface between the database and end users or application programs.

Relational Data Model

- ➔ The most commonly used data model is Relational Data Model.
- ➔ In the relational data model, database is represented as collection of related tables.
- ➔ Each table is termed as relation and has its unique name in the relational data model.
- ➔ Tables are formed by using rows and columns.
- ➔ A row (horizontal subset) of a table represents a tuple or record, while column (vertical subset) of a table represents an attribute.
- ➔ Each row in the table represents a related set of values.

The diagram illustrates the components of a table in a relational database. The table is labeled 'STUDENT' as the Relational Variable. The columns are labeled as Attributes (Columns) and the rows are labeled as Tuples (Rows). The table structure is as follows:

AdmNo	SName	SClass	Sec	Average
101	Amit	12	A	85
105	Annu	12	D	65
203	Neena	11	B	95
205	Madhwan	10	B	75
305	Suresh	9	C	70

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Let us now understand the commonly used terminologies in relational data model:

→ **Relation:** A relation may be thought of as a set of rows with several columns. Table is also known as relation. A relation has the following properties:

- Row is a real world entity or relationship.
- All values in particular column are of same kind.
- Order of column is immaterial.
- Each row is distinct.
- Order of row is immaterial.
- For each row, each column must have an atomic value (indivisible).
- For a row, a column cannot have more than one value.

→ **Domain:** A domain is a pool of values from which the actual value present in a given column is taken.

→ **Tuple / Rows:** This is the horizontal part of the relation. One row represents one record of the relation. The rows of a relation are also called tuples.

→ **Attributes / Columns:** The columns of a table are called attributes. The column is the vertical part of the relation.

→ **Degree:** The number of attributes (columns) in a relation determines the degree of relation. *So, the degree of student table is 5*

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→ **Cardinality:** It is the number of rows (or tuples) in a table. So, the cardinality of table Student is 6

Keys

Keys are an important part of a relational database and a vital part of the structure of a table.

They help enforce integrity and help identify the relationship between tables. Different types of keys are-

KEY	DESCRIPTION
Primary Key	A primary key is an attribute or a group of attributes that can uniquely identify tuples within the relation.
Candidate Key	A candidate key is one that is capable of becoming the primary key. (i.e candidate for primary key position).
Alternate Key	A candidate key that is not the primary key is called an alternate key.
Foreign Key	A non-key attribute, whose value(s) are derived from the primary key of some other table, is known as foreign key in its current table.

Let us now understand the commonly used terminologies in relational data model using below given Table 'Student':

AdmNo	SName	SClass	Sec	Average
101	Amit	12	A	85
105	Annu	12	D	65

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203	Neena	11	B	95
205	Madhwan	10	B	75
305	Suresh	9	C	70
483	Umar	6	A	60

Fields (Attributes/Columns): *AdmNo, SName, SClass, Sec and Average.*

Tuples (Rows/Records):

101	Amit	12	A	85
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Domain: Possible values of section are ('A', 'B', 'C', 'D')

Degree: 5 (Number of columns).

Cardinality: 6 (Number of rows).

Candidate Key: In the above table, *AdmNo* and *SName* has unique values. Therefore, *AdmNo* and *SName* are candidate keys.

Primary Key: Out of the *AdmNo* and *SName*, *AdmNo* is the primary key.

Alternate Key: In the candidate key, *AdmNo* is the primary key and the *SName* is the Alternate key.