

Relational Database Management System (RDBMS)

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February 2026

I. INTRODUCTION

Abstract

In the modern digital world, large amounts of data are generated every day through various information systems and applications. Managing this data efficiently is very important for organizations. A Relational Database Management System (RDBMS) is a type of database system that stores data in the form of tables with rows and columns. It uses structured query language (SQL) for managing and retrieving data. RDBMS ensures data accuracy, security, and consistency. This paper focuses on the basic concepts of RDBMS, its structure, features, advantages, and applications. The study aims to provide a simple and clear understanding of relational databases for students and beginners.

Keywords: *RDBMS, Relational Database, SQL, Tables, Data Management, Normalization*

In today's information age, data plays an important role in decision-making and business operations. Organizations such as banks, hospitals, schools, and companies generate large volumes of data every day. Managing this data manually is difficult and unreliable. Therefore, computer-based systems are used to store and manage data efficiently.

A Relational Database Management System (RDBMS) is a software system that stores data in the form of related tables. These tables are connected using keys and relationships. RDBMS provides a systematic way to organize data and allows users to access information using SQL. Popular RDBMS software includes MySQL, Oracle, PostgreSQL, and Microsoft SQL Server.

The main objective of this paper is to explain the fundamental concepts of RDBMS and its

importance in modern computing.

II. OVERVIEW OF RDBMS

An RDBMS is based on the relational model introduced by E. F. Codd. In this model, data is stored in tables called relations. Each table consists of rows (records) and columns (attributes). Each row represents a single entry, and each column represents a specific type of data.

Every table in an RDBMS has a primary key that uniquely identifies each record. Relationships between tables are created using foreign keys. These relationships help in maintaining data integrity and avoiding duplication.

RDBMS supports SQL, which is used to create tables, insert data, retrieve records, update information, and delete unwanted data. It also provides transaction management to

ensure that database operations are performed safely and correctly.

III. STRUCTURE AND FEATURES OF RDBMS

A. Structure of RDBMS

The basic structure of RDBMS includes:

- 1. Tables that store data in rows and columns*
- 2. Fields that represent columns in a table*
- 3. Records that represent rows in a table*
- 4. Keys that are used to identify and relate records*
- 5. Indexes that improve data retrieval speed*

B. Features of RDBMS

Important features of RDBMS include:

- Data integrity*
- Data security*
- ACID properties*
- Multi-user access*
- Backup and recovery*

- *Transaction management*

ACID properties ensure reliable transactions through atomicity, consistency, isolation, and durability. These features make RDBMS suitable for critical applications.

IV. NORMALIZATION AND SQL IN RDBMS

A. Normalization

Normalization is the process of organizing data to reduce redundancy and improve consistency. It divides large tables into smaller related tables.

Main Normal Forms:

- 1. First Normal Form (1NF): Removes duplicate columns and ensures atomic values*
- 2. Second Normal Form (2NF): Removes partial dependency*
- 3. Third Normal Form (3NF): Removes transitive dependency*

After normalization, data becomes easier to manage and update.

B. SQL in RDBMS

SQL is used to manage relational databases. It helps users create, modify, and retrieve data efficiently.

Examples:

Create Table:

```
CREATE TABLE Students (
    StudentID          INT,
    Name               VARCHAR(50),
    Age                INT
);
```

Select Query:

```
SELECT Name FROM Students
WHERE Age > 18;
```

SQL makes data handling simple and efficient.

V. ADVANTAGES, APPLICATIONS, AND CONCLUSION

A. Advantages of RDBMS

- *Reduces data duplication*
- *Maintains data accuracy*
- *Ensures security*
- *Easy data retrieval*
- *Supports large databases*

B. Applications of RDBMS

RDBMS is widely used in:

- *Banking systems*
- *Airline reservation systems*
- *Hospital management*
- *University databases*
- *Business accounting systems*
- *E-commerce platforms*

C. Conclusion

Relational Database Management Systems are essential in modern information systems. They provide a reliable and organized way to store and manage data. With features such as normalization, SQL support,

and data security, RDBMS ensures efficient data handling. Understanding RDBMS is important for students and professionals working in the field of information technology.

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