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Affiliated to Osmania University
Department of Computer Applications
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ASSIGNMENT - I

MCA 2nd Year 4th Sem

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SUBJECT: Distributed Database Systems

① How does normalization contribute to the efficiency and integrity of relational database?

* Elimination of Redundancy :-

By organizing data into tables in such a way that redundant data is minimized, normalization reduces the amount of storage needed and decreases the likelihood of storage needed and of data anomalies to be made in one location.

* Improved Data Integrity :-

Normalization ensures that data dependencies are logical and that data is consistent. This is achieved through the establishment of relationships b/w tables which enforces intentional and prevent anomalies such as insert, update and delete anomalies.

* enhanced Query Performance :-

Although normalization can sometimes lead to the creation of more tables and complex queries the structured organization

Can also make indexing and searching more efficient.

* ease of maintenance :-

A well-normalized database is easier to maintain and extend.

* Changes to the database schema (like adding new fields or tables).

* can be done without affecting the existing structure and without introducing inconsistencies.

* Data consistency :-

By ensuring that each piece of data is stored in one place and one place list only normalization reduces the risk of the data inconsistencies that we can occur when the same data is stored in multiple of their locations is known as the data consistency.

② Explain the process of query optimization in a relational database management system (RDBMS)!

A The query optimization in an RDBMS involves selecting the most efficient way to execute a given query by considering various possible execution plans.

① Parsing:

The SQL query is parsed to check for syntax errors and to understand its structure.

② Logical Optimization:

The RDBMS evaluates different physical execution plans. This step involves considering various ways to implement the logical operations.

③ Physical Optimization:

The RDBMS transforms the logical query plan to improve its performance. This involves executing the query using rules such as predicate pushdown, join ordering, and indexing the operations.

④ cost estimation :

The optimizer estimates the cost of different execution plans based on factors like I/O operations, CPU usage, and memory usage.

It uses statistics about the database such as the number of rows in the tables and the distribution of values in columns.

⑤ plan selection :

The optimizer selects the execution plan with the lowest estimated cost. This chosen plan is then used to execute the query.

⑥ execution :

The selected execution plan is executed by the query execution engine, which retrieves the data according to the plan.

- ③ Explain the role of database management system in the architecture of modern database systems?

DBMS play a crucial role in the architecture of modern database systems.

① Data Storage management

The DBMS efficiently store data in a structured format, handling data storage structures on physical media and managing data structures like tables, indexes and schemas.

② Data Retrieval and Query Processing

DBMS provide powerful query language like (SQL) for data retrieval and manipulation.

* They optimize query processing to ensure efficient data access and the retrieval.

③ Transaction management

DBMS ensure that all database operations are processed reliably and adhere to acid properties. This is crucial.

for maintaining data integrity, especially in multi-user environment.

④ Concurrency Control :-

DBMS manage concurrent data access by multiple user preventing conflicts and ensuring that transactional are executed in a safe manner without data corruption.

⑤ Data security :-

DBMS implement security measures to protect data against unauthorized access and behavioral breaches. This includes user authorized access control and encryption.

Q) what are the key responsibilities of database administrators (DBAs) in managing database system?

A) Installation and configuration :-

DBAs install and configure the database software and ensure that it is properly set up according to the organization's requirement.

(S) Discuss the importance of implementing access controls and security measures to protect data in a database system in detail?

(A) * Preventing unauthorized Access :-

Access controls ensure that only Access authorized users can access the database and its resources this prevents unauthorized individuals from viewing, modifying, or deleting the data.

* Protecting sensitive information :-

Database often contain sensitive information such as personal data financial records and intellectual property security measures protect this data from being compromised or leaked.

* Ensuring data integrity :-

By restricting who can modify data access controls help maintaining data integrity.

② Data base design :-

DBAs participate in data base design by defining the schemas, tables, indexes, by defining views and other structures to optimize performance and meet business needs.

③ Performance tuning :-

DBAs monitor and optimize database performance, including tuning SQL queries managing indexes and ensuring efficient use of resources.

④ Backup and Recovery :-

DBA implement and manage back strategies to ensure data can be restored in case of loss or corruption they also regularly test recovery procedures.

⑤ Security management :-

DBA ensure the data base is secure by managing user access, roles, permissions, and implementing encryption and other security measures.

* only authorized users can make changes, reducing the risk of accidental (or) malicious data corruption.

⑤ Compliance with Regulations :

many industries are subject to regulations that mandate strict data protection measures.

* implementing robust security and access control ensures compliance and avoid legal penalties.

⑥ Educating users :

Training and educating users about security policies and best practices are essential components of the comprehensive security strategy.