

**Course Title : Database System**

**Course Code : CCE - 223**

**Assignment : 01**

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1. **Discuss Database and Database language evaluation.**

**Answer:**

A database is an organized set of logically connected data. The information transforms into helpful knowledge, structured and maintained to fit the user's needs. Apart from storing the data itself, a database also keeps the relationships between data points.

In the broader sense, a database is an integrated set of information about a system and the procedures for maintenance and usage. Unlike spreadsheets, multiple users and applications access the storage at once.

Databases have a broad application spectrum. Typical examples include:

* Banking systems keep databases for clients, bank accounts, credits, transactions, etc.
* Airline traffic keeps the information about flights, ticket reservations, and similar. Airline companies are the first sector to use geographically distributed databases.
* Universities use databases to record information about students, applications, grades, courses, etc.
* Credit card transactions contain tabs on payments and generate monthly reports.
* Telecommunication companies store information about calls, generate monthly bills, track the communication line, etc.
* The finance sector tracks the sales and purchases of financial instruments such as bonds and shares.
* Commerce and [e-commerce](https://ccbill.com/blog/build-ecommerce-website) businesses store data about consumers, products, and various price catalogs.
* Manufacturing businesses manage supply chains, production lines, storages, generate invoices, etc.
* Human resources stores information about employees, paychecks, taxes, benefits, etc.

The list above shows how crucial databases are for any business type. With modern user interfaces, the backend is hidden when accessing a database, so many users are unaware they use one daily.

**Database language evaluation:**

The first automated database connects to Herman Hollerith, who patented the system for automatic data processing in 1884. The 1890 US census used the punched cards counter system, and the collection of cards represents the first automated database system.

Each card had 80 columns and characterized information about a person. Usually, census information would take two years to process. However, the punch card system and the automated card reading mechanism took only around six weeks to process the data. The punched cards system was used throughout the 20th century, especially for voting and clocking in for work.

After World War II, companies and government institutions started using computers for simple linear accounting databases. The first computerized databases were used for specific tasks and lacked flexibility.

Databases in the 1960s:

In the 1960s, document databases had a dominant role. The first database management systems appeared in this decade, and they were used for big and complex projects, such as the Apollo moon landing.

Databases in the 1970s:

Databases become a commercial reality in the 1970s. Hierarchical and network systems for managing data are introduced mainly for handling [complex data structures](https://phoenixnap.com/kb/data-structures), such as factory accounts, when purchasing raw materials.

This decade includes the first-generation commercial DBMS, and some are still in use today. Several drawbacks are:

* The data was hard to retrieve. Companies used complex programs in the 1970s to access simple data.
* Limited data independence made information hard to change and update.
* No theoretical foundation for any database models.

Databases in the 1980s:

The 1980s address the drawbacks of the previous decade. The relational data model appears during the 1970s, and the second-generation DBMS finds commercial business use in the 1980s. When using the relational model, all data is in a familiar tabular format. A relatively simple programming language (SQL) retrieves the data from the database.

The new database model allowed easier data access to people who were not programmers, addressing the most significant issue with the previous models. The relational model was convenient for client/server communication, parallel data transfers, and a GUI made usage simpler.

Databases in the 1990s:

The 1990s gave rise to internet application and data storage systems. Multimedia data (graphics, sound, pictures, and videos) became more common. Massive amounts of both structured and unstructured data were standard. Due to data complexity rising, relational database systems turned to the object-oriented approach.

Databases in the 2000s:

Three new database types appear: XML, NoSQL and [New SQL](https://phoenixnap.com/kb/newsql) databases.

XML databases are a highly structured document-based type. Querying is allowed through XML attributes with varying degrees of flexibility.

NoSQL databases answer the strong demand for highly flexible distributed database systems, which use eventual consistency and do not require a fixed schema. The NoSQL type is highly scalable, and stores [de-normalized data](https://phoenixnap.com/kb/database-denormalization).

New SQL aims to combine the best attributes from NoSQL databases, such as scalability, while using SQL and maintaining [ACID compliance](https://phoenixnap.com/kb/acid-vs-base).

**2. Why do you study database?**

**Answer:**

A database is a collection of data, usually stored in electronic form. A database is typically designed so that it is easy to store and access information.

A good database is crucial to any company or organization. This is because the database stores all the pertinent details about the company such as employee records, transactional records, salary details etc.

The various reasons a database is important are −

## Manages large amounts of data

A database stores and manages a large amount of data on a daily basis. This would not be possible using any other tool such as a spreadsheet as they would simply not work.

## Accurate

A database is pretty accurate as it has all sorts of build in constraints, checks etc. This means that the information available in a database is guaranteed to be correct in most cases.

## Easy to update data

In a database, it is easy to update data using various Data Manipulation languages (DML) available. One of these languages is SQL.

## Security of data

Databases have various methods to ensure security of data. There are user logins required before accessing a database and various access specifiers. These allow only authorised users to access the database.

## Data integrity

This is ensured in databases by using various constraints for data. Data integrity in databases makes sure that the data is accurate and consistent in a database.

## Easy to research data

It is very easy to access and research data in a database. This is done using Data Query Languages (DQL) which allow searching of any data in the database and performing computations on it.

**3. Job description of Database related job published in online job portal.**

**Answer:**

### SQL Developer

SQL developers have some of the most important roles involving SQL. They are responsible for developing SQL databases for a wide range of applications and business purposes. Depending on the needs of the organization, their duties may include all database backend work as well as working with architecture and management for scaling SQL databases.

### SQL Database Administrator

What someone has created, someone must watch over. This is what database administrators (DBAs) do, and they are very important in every organization.

The day-to-day responsibility of DBAs is to manage databases used by others to do their work efficiently and without problems. DBAs also ensure the condition of the entire system and the reliability of the network.

### Database Tester

### Did something break in the database? Is it an isolated case, a bug, or badly written code? Database testers look at problems like these. Their daily work consists primarily of finding threats and solutions for databases to ensure their smooth operation and effectiveness.

Testers present their findings in reports to IT functions (e.g. developers), who implement corrections and improvements based on these findings. Testers often play the role of ordinary database users and even act like them to see if everything works well.

### SQL Data Analyst

Do you have good analytical skills? Can you think outside the box, summarize the data well, and present your conclusions clearly and convincingly? Then, you will do well as a data analyst, a role that is experiencing increasing demand in many industries.

They analyze data collected by the organization to help develop strategies and improve processes. The findings of data analysts often lead to strategic decisions of managers, changes in operation, or improvements in the workflow.

### Business/Financial Data Analyst

This position also involves data analysis and working with databases. The difference from the data analyst role described earlier is fundamental—the purpose. While the scope of the SQL data analysts is typically general (customers, markets, productions, operations, etc.), the work of business/financial data analysts is primarily to improve or project the organization’s financial performance: profits, losses, and risks.

### SQL Data Scientist

This is a job that requires not only a knowledge of SQL but also of statistics, probability, and mathematics. Data scientists do more than just write lines of code or analyze data. They use technology solutions daily to draw conclusions and develop statistical and other predictive models using data.

Predicting customer behaviors with data allows an organization to make various business decisions and take different actions. Consider, for example, the situation in which a consumer applies for a mortgage with a lender. The lender needs to evaluate the prospective borrower’s profile and behavior to quantify his or her likelihood to repay the loan, so that it can decide to approve or reject the application. Predictive models are often used for this purpose.

### Data Modeler

Data modeling, which often uses SQL, is one of the most important processes in a modern enterprise. Data modelers design and structure different elements of data and how they relate to each other to optimize the performance of database operations.

To be a data modeler, in addition to a deep knowledge of IT, you need good communication skills and the knack for solving problems, because you will need to understand customer needs and deliver convincing explanations and recommendations. **4. Requirements or skill to get the Database related job.**

**Answer:**

Here are some of the common requirements and skills that are typically required to get a job in the field of database management and administration

* Education: Most employers require a bachelor's degree in Computer Science, Information Systems, or a related field. Some employers may also require a master's degree in a related field.
* Database management skills: Candidates should have a strong understanding of database design, implementation, and management principles, as well as experience with database technologies such as Oracle, SQL Server, MySQL, and MongoDB.
* Database programming skills: Candidates should have experience with programming languages such as SQL, PL/SQL, and T-SQL, as well as knowledge of database programming best practices.
* Security skills: Candidates should have knowledge of database security principles and best practices, including access controls, user management, and encryption.
* Analytical skills: Candidates should have strong analytical skills and be able to troubleshoot and resolve complex database issues.
* Communication skills: Candidates should have strong written and verbal communication skills, as well as the ability to work collaboratively with team members and stakeholders.
* Certifications: Industry-recognized certifications such as Oracle Certified Professional, Microsoft Certified Database Administrator, and MongoDB Certified DBA can help candidates stand out and demonstrate their expertise.
* Experience: Employers typically prefer candidates with 3-5 years of relevant experience in database management and administration.
* Time management skills: Candidates should have the ability to manage multiple tasks simultaneously and work efficiently under tight deadlines.

By possessing these skills and meeting the requirements, candidates can increase their chances of getting hired for a job in database management and administration.  
 **5. What are the learning outcomes of this Database course**

**Answer:**

The learning outcomes of a database course may vary depending on the specific course and its level of complexity. However, here are some common learning outcomes that one can expect to achieve from a comprehensive database course:

* Knowledge of database concepts: Students should gain a deep understanding of the basic concepts of databases, such as data modeling, database design, database management, data manipulation, and data analysis.
* Proficiency in database programming languages: Students should develop programming skills in common database languages such as SQL, PL/SQL, and T-SQL.
* Understanding of database architectures: Students should learn about different types of database architectures and their advantages and disadvantages, including relational, NoSQL, and distributed databases.
* Ability to design and implement databases: Students should gain the skills to design and implement databases, including creating tables, defining relationships, setting up indexes, and implementing security measures.
* Knowledge of database management: Students should learn how to manage databases, including database backups and recovery, performance tuning, and security management.
* Ability to work with database tools and software: Students should gain hands-on experience using database tools and software such as Oracle, SQL Server, MySQL, and MongoDB.
* Understanding of data analysis: Students should learn how to analyze data using SQL and other database programming languages, including aggregating data, filtering data, and joining data from multiple tables.
* Communication and collaboration skills: Students should develop communication and collaboration skills by working on group projects, presenting their work to the class, and participating in class discussions.

Overall, a database course can provide students with the skills and knowledge they need to design, implement, and manage databases in a professional setting. These skills can be valuable in a wide range of career paths, including database administrators, data analysts, software developers, and data scientists.

**6. What are the research area of this database course?**

**Answer:**

The research areas of database courses may vary depending on the specific focus of the course and the research interests of the instructor or institution. However, here are some common research areas in the field of database management and administration:

* Data mining and machine learning: Research in this area focuses on developing algorithms and techniques for discovering patterns and insights from large datasets, often using machine learning and data mining techniques.
* Big data and NoSQL databases: Research in this area explores the challenges and opportunities presented by the large volumes of data generated by modern applications and the need for scalable, high-performance NoSQL databases.
* Database security and privacy: Research in this area focuses on developing techniques and best practices for securing and protecting sensitive data in databases, including access control, encryption, and data masking.
* Cloud databases and distributed systems: Research in this area explores the challenges and opportunities presented by cloud-based databases and distributed systems, including scalability, fault tolerance, and data consistency.
* Data visualization and analytics: Research in this area focuses on developing tools and techniques for visualizing and analyzing data in databases, including graph databases and time-series databases.
* Database performance optimization: Research in this area explores techniques for optimizing database performance, including query optimization, index design, and caching strategies.
* Database management and administration: Research in this area focuses on developing best practices for managing and administering databases, including backup and recovery, replication, and disaster recovery planning.

Overall, research in the field of database management and administration is critical for advancing our understanding of how to design, implement, and manage databases effectively and efficiently.