DATABASE ESSENTIALS

Lecture 7

stephen.donald@cbe.ac.tz

INTRODUCTION TO SQL

- SQL is the standard relational database language.

- SQL is a standard language for storing, manipulating and retrieving data in databases.

- Parts of SQL language
  - Data Definition Language (DDL)
  - Data Manipulation Language (DML)
  - Embedded SQL and Dynamic SQL

INTRODUCTION TO SQL…

Data Definition Language (DDL)

- DDL provide commands for defining the relations, deleting the relations and
  modifying the existing relation schemas.

- Types of DDL
  - *View Definition Language (VDL)*
    - The DDL that provide commands for defining and dropping the views.
  - *Integrity*
    - The DDL that provide commands for specifying integrity constraints that must be satisfied by the data stored in the database.
  - *Authorization*
    - The DDL provide commands for specifying access rights to the relations and views.

INTRODUCTION TO SQL…

Data Manipulation Language (DML)

- DML provides the ability to query information from the database and to insert tuples into, delete tuples from, and modify tuples in the database.

Embedded SQL and Dynamic SQL

- Embedded SQL defines how SQL statements can be embedded within general purpose programming languages like C, C++, Java etc.

- The language in which SQL queries are embedded is referred to as a host language.

- Dynamic SQL allows programs to construct and submit SQL queries at run time.

DATA DEFINITION…

Some SQL data types are:-

- **char(n):** A fixed-length character string with user-specified length n.

- **varchar(n):** A variable-length character string with user-specified maximum length n.

- **int:** An integer.

- **smallint**: A small integer, a subset of integer type.

DATA DEFINITION…

Some SQL data types are:-

- **numeric(p, d):** A fixed-point number with user-specified precision.

    The number consists of p digits (plus a sign), and d is the number of digits after the decimal point.

    Example, **numeric(3,1)** allows 44.5 to be stored exactly. Neither 444.5 nor 0.32 can be stored exactly in a field of this type.

- **date:** It is used to store date and time values.

DATA DEFINITION…

Schema Definition

- An SQL database is defined by using the **create database** command.

- Command: **CREATE DATABASE database;**

- Example: **CREATE DATABASE college;**

DATA DEFINITION…

Schema Definition

- An SQL relation is defined by using the **create table** command.

- Example: Create a relation **department** in the database.

    CREATE TABLE *department*
        (*dept_name* **varchar** (20),
        building **varchar** (15),
        budget **numeric** (12,2),
        primary key (*dept_name*));

- To remove a relation from an SQL database, use the **drop table** command.

- Example: **DROP TABLE department;**

DATA DEFINITION…

- Tuples are deleted from a relation using a **delete** command.

- Example:

  DELETE FROM *department;*

  This command delete all tuples from the department relation.

DATA MANIPULATION…

- Data is loaded into a relation using the **insert** command.

- Example:

  INSERT INTO *department* **VALUES**('ICT', 'Block 1',20000.00);

- The values are specified in the order in which the corresponding attributes are
  listed in the relation schema.

BASIC STRUCTURE OF SQL QUERIES

- The basic structure of an SQL query consists of three clauses: select, from, and where.

- The select clause is used to list the attributes desired in the result of a query.

- The from clause is a list of the relations to be accessed in the evaluation of the query.

- The where clause is a predicate involving attributes of the relation in the from clause.

BASIC STRUCTURE OF SQL QUERIES…

- Example:
    SELECT name **FROM** department

- To eliminate duplicates, insert the keyword **distinct** after **select**.

- Example:
    SELECT DISTINCT first_name **FROM** student;

BASIC STRUCTURE OF SQL QUERIES…

- The select clause may contain arithmetic expressions involving the operators +, -, ∗, and / operating on attributes of tuples.

- Example

    SELECT *ID, name, dept_name, salary * 1.1* **FROM** *instructor;*

- The where clause allows the selection of only those rows in the result relation that satisfy a specified predicate.

- Example:
    - "Find the names of all instructors in the ICT department who have salary greater than Tsh. 3,000,000."
    - The query will be written as:

        SELECT name **FROM** instructor **WHERE** dept_name = 'ICT' **and** salary > 3000000;

BASIC STRUCTURE OF SQL QUERIES…

- Queries on multiple relations

- Example

    Consider the relations below

dept_name	building	budget
ICT	Block A	1200000
Metrology	Met House	1000000
BA	Block B	2000000

department

ID	name	dept_name	salary
10	James	ICT	12000
11	Hassan	BA	10000
12	Neema	ICT	20000
13	Brenda	ICT	43000
14	Salma	Metrology	50000

instructor

To select the instructor name, department name and the building, the query is as follows:-

SELECT name, instructor.dept_name, building **FROM** instructor, department **WHERE** instructor.dept_name= department.dept_name;

"If you are working on something that you really care about, you don't have to be pushed. The vision pulls you."
– Steve Jobs