Database Constraints

Database Integrity Constraints

- A *constraint* is a rule that the database manager enforces.
- Integrity constraints guard against accidental damage to the database, by ensuring that authorized changes to the database do not result in a loss of data consistency.
  - A checking account must have a balance greater than $10,000.00
  - A salary of a bank employee must be at least $4.00 an hour
  - A customer must have a (non-null) phone number

Database Integrity Constraints

- Integrity rules may be divided into three broad categories:
  - Domain integrity rules
  - Entity integrity rules
  - Referential integrity rules

Domain Integrity

- Domain integrity rules are concerned with maintaining the correctness of attribute values within relations.
- Domain integrity ensures the data values inside a database follow defined rules for values, range, and format.
- A database can enforce these rules using a variety of techniques, including CHECK constraints, UNIQUE constraints, and DEFAULT constraints.

Entity Integrity

- Entity integrity ensures each row in a table is a uniquely identifiable entity. We can apply entity integrity to a table by specifying a PRIMARY KEY constraint.
- Entity Integrity can be enforced through indexes, UNIQUE constraints and PRIMARY KEY constraints.

Entity Integrity

- Entity Integrity ensures two properties for primary keys:
  - The primary key for a row is unique; it does not match the primary key of any other row in the table.
  - The primary key is not *null*, no component of the primary key may be set to *null*.
- The uniqueness property ensures that the primary key of each row uniquely identifies it; there are no duplicates.
- The second property ensures that the primary key has meaning, has a value; no component of the key is missing.
- The system enforces Entity Integrity by not allowing operations (INSERT, UPDATE) to produce an invalid primary key. Any operation that creates a duplicate primary key or one containing *nulls* is rejected.

Referential integrity

- Referential integrity rules are concerned with maintaining the correctness and consistency of relationships between relations.
- *Referential integrity* is the state of a database in which all values of all foreign keys are valid.
- We can apply referential integrity using a FOREIGN KEY constraint and CHECK constraints.

Referential integrity

- A table in which a referential constraint and a foreign key are defined is called a *referencing table*, while a table that is referenced from a referencing table with a foreign key is called a *referenced table*.
- In a referenced table, a primary key that is referenced by the foreign key must be pre-defined.

Referential integrity

- The rules are:
  1. We can't delete a record from a primary table if matching records exist in a related table.
  2. We can't change a primary key value in the primary table if that record has related records.
  3. We can't enter a value in the foreign key field of the related table that doesn't exist in the primary key of the primary table.
  4. However, we can enter a Null value in the foreign key, specifying that the records are unrelated.