





CSE3103 : Database

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Normalization

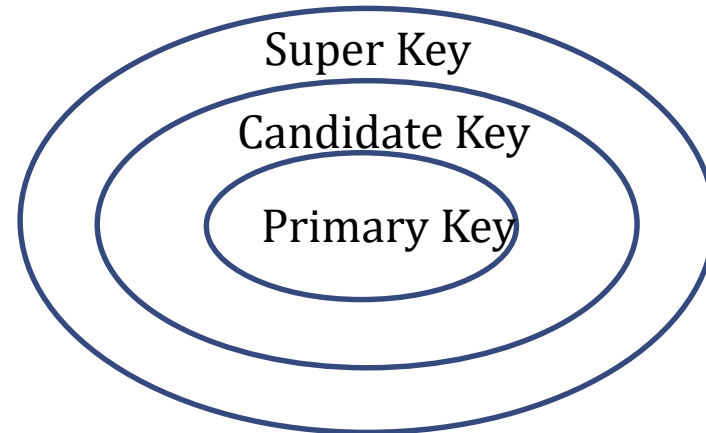
- Database Normalization is a technique of organizing the data in the database.
- Normalization is a systematic approach of decomposing tables to eliminate data redundancy(repetition) and undesirable characteristics like Insertion, Update and Deletion Anomalies.
- Normalization is used for mainly two purposes
 - Eliminating redundant(useless) data.
 - Ensuring data dependencies make sense i.e data is logically stored.

Candidate Key

- A Candidate Key is an attribute (possible composite) that can be used to uniquely identify each tuple in a relation.
- A relation may have more than one candidate key.
- If so, one candidate key is nominated as the primary key for that relation.
- Recall chapter ERD for the more details.

Keys:

1. Super Keys: All the attributes can for super keys.
 1. Suppose, $A = \{1, 2, 3, 4\}$
 2. So, $P(A) = \{\{1\}, \{2\}, \{3\}, \{4\}, \{1,2\}, \{2,3\}, \{3,4\}, \dots, \{1,2,3,4\}, \{\}\}$
2. Candidate Key: Super keys which value can be minimal.
3. Primary Key: Candidate key which value is unique.
4. Alternative Key: Keys which are candidate key but not in primary key.
5. Composite Key: More than one attribute jointly declare as primary key is the composite key.
6. Foreign Key: Primary key which is used another table as reference is foreign key.



Functional Dependency

- Functional dependency (FD) is a set of constraints between two attributes in a relation.
- Functional dependency says that if two tuples have same values for attributes A_1, A_2, \dots, A_n , then those two tuples must have to have same values for attributes B_1, B_2, \dots, B_n .
- Functional dependency is represented by an arrow sign (\rightarrow) that is, $X \rightarrow Y$, where X functionally determines Y .
- **The left-hand side attributes determine the values of attributes on the right-hand side.**

Functional Dependency

- Determinant
- Objects of Determinant
- Example:



- Student_ID \rightarrow {First_Name, Last_Name}



- Course_No, Course_Name \rightarrow Faculty_Name



- Course_No \rightarrow Course_Name, Faculty_Name



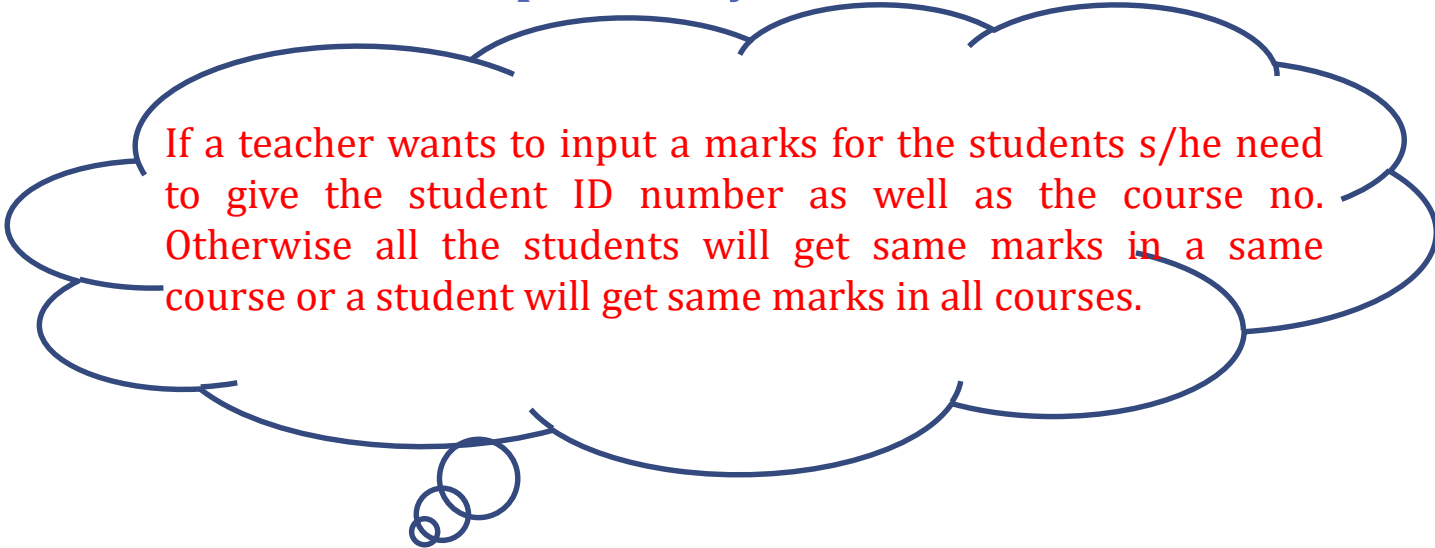
- Marks \rightarrow Grade

Partial Functional Dependency

- If an attribute is removed from the composite determinant but the dependency is not impacted, then it will be Partial Functional dependency.
- Example:
 - $\text{Course_No, Course_Name} \rightarrow \text{Faculty_Name}$

Full Functional Dependency.

- If an attribute is removed from the composite determinant but the dependency is impacted, then it will be Full Functional dependency.
- Example:



If a teacher wants to input a marks for the students s/he need to give the student ID number as well as the course no. Otherwise all the students will get same marks in a same course or a student will get same marks in all courses.

- **Student_ID, Course_No → Marks**

Transitive Functional Dependency

- If some attributes is created a chain of dependency or a cycle among them then that is created a transitive dependency.
- Example:

R is a relation with attribute A, B, C

If, $A \rightarrow B$

$B \rightarrow C$

Then, $C \rightarrow A$

