

TASK-8: Normalizing Database using functional dependencies up to BCNF

Aim:

To normalize a database using functional dependencies (FDs) up to Boyce-Codd Normal Form (BCNF) with the help of a table normalization tool.

Theory

→ functional dependency (FD):

A functional dependency (FD) describes a relationship between attributes in a relation. If attribute A determines attribute B, we write $A \rightarrow B$.

Normalization

Normalization is the process of organizing data in a database to minimize redundancy and improve data integrity.

Normal form condition

1NF

All attributes contain atomic (indivisible) values

2NF

IN 1NF and all non-key attributes are fully dependent on the primary key

3NF

IN 2NF and no transitive dependency exists

BCNF

for every $FD X \rightarrow Y$, X must be a superkey

Examples:

Consider relation

R(Student ID, Course ID, Instructor, Room) and the following

FDs:

1. Student ID, Course ID \rightarrow Instructor, Room

2. Instructor \rightarrow Room

Step 1: 1NF

2NF

Step 2: 2NF

The key is (Student ID, Course ID)

No partial dependencies \Rightarrow Already in 2NF

Step 3: 3NF

check for transitive dependencies;

• Instructors \rightarrow Room (transitive dependency) Decompose,

• R₁ (Student ID, Course ID, Instructors)

• R₂ (Instructors, Room)

Step 4: BCNF

check BCNF condition;

• In R₁ (Student ID, Course ID) is a key \rightarrow OK.

• In R₂ Instructors - Room, and Instructors is the key - OK.

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PERFORMANCE (5)	5
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AVOGE (5)	4
IRD (5)	-
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WITH DATE	2/2/23

Result:

The given relation is successfully normalized up to

Third - Normal Form (3NF).