

Task 7

Normalizing Databases using Functional Dependencies upto BCNF

1. Apply the Functional Dependency and Normalize to 1NF.

Step 1: Identify functional dependency (FDs)

OrderTable (Order-Id, Cust-Id, Order-date, Order-Total, Payment-status)

• FD1: Order-Id \rightarrow Cust-Id, Order-date, Order-Total, Payment-status.

Customer (Cust-Id, Cust-Name, Cust-contact, Cust-email, Cust-Address)

• FD2: Item-Id \rightarrow Item-Name, Price, Category, Rest-Id

Menu-Item (Item-Id, Item-Name, Price, Category, Rest-Id)

• FD3: Item-Id \rightarrow Item-Name, Price, Category, Rest-Id.

Normalization to 1NF (First Normal Form)

- Ensure that each column contains only atomic values.
- Removes any repeating groups.

Normalization the Relations using FD+ and $\alpha+$

- Compute FD+ using Armstrong's Axioms.
- Identify minimal keys and remove redundant FDs.

Closure for OrderTable:

- FD+ : { Order-Id \rightarrow Cust-Id, Order-Date, Order-Total, Payment-Status }

3. Find the Minimal Cover and Canonical Cover

Minimal Cover

- FD1 : Order_ID \rightarrow Cust_ID, Order_date, Order_Total, Payment_Status
- FD2 : Cust_ID \rightarrow Cust_Name, Cust_Contact, Cust_Email, Cust_Address
- FD3 : Item_ID \rightarrow Item_Name, Price, Category, Rest_ID

Canonical Cover :

- No redundancy detected

4. Normalize to 2NF.

- A relation is in 2NF if it is in 1NF and has no partial dependencies.
- Remove partial dependencies by creating separate relations.

Normalization to 2NF :

- OrderTable (Order_ID, Order_date, Order_Total, Payment_Status)
- Customer (Cust_ID, Cust_Name, Cust_Contact, Cust_Email, Cust_Address)
- Menu_Item (Item_ID, Item_Name, Price, Category, Rest_ID)

5. Normalize to 3NF

- A relation is in 3NF if it is in 2NF and has no transitive dependencies.
- Ensure non-prime attributes depend only on primary keys.

Normalization to 3NF:

- Restaurant (Rest_ID, Rest_Name, Rest_Location, Rest_contact)
- Menu_Item (Item_ID, Item_Name, Price, Category, Rest_ID)

6. Normalization to BCNF

- A relation is in BCNF if, for every function dependency ($X \rightarrow Y$), X is a superkey.
- Identify and remove transitive dependencies.

• Normalization to 80NF:

- OrderTable (Order_ID, Cust_ID, Order_date, Order_Total, Payment-status)
- Customer (Cust_ID, Cust_Name, Cust_contact, Cust_email, Cust_Address)
- Menu_Item (Item_ID, Item_Name, Price, Category, Rest_ID)