

Note:

For the all entities that contain subclasses, ER method has been used to create tables for the subclasses.

1. User (UserID, Name)

Key: (UserID)

FDs: UserID \rightarrow Name

Table is already in 3NF, as only two attributes are involved.

2. Order (OrderID, Date-time, UserID)

Key: (OrderID)

FDs: OrderID \rightarrow Date-time, UserID

UserID, Date-time \rightarrow OrderID

Table is in 3NF, as the LHS contains the key of the table.

3. Product-in-order (UserID, OrderID, ProductName, ShopName, Status, Delivery-Date, Rate-Date-Time, Rating)

Key: (UserID, OrderID, ProductName, ShopName)

FDs: OrderID, ProductName, ShopName \rightarrow Status, Delivery-Date

UserID, ProductName, ShopName \rightarrow Rate-Date-Time, Rating

OrderID \rightarrow UserID

This is not in 3NF, as the LHS of the non-trivial FDs do not contain the key nor do the RHS of the FDs contain a part of the LHS.

Following the 3NF decomposition algorithm:

The FDs are already in minimal basis. Create a table for each of the FDs, since none of the tables contain the key of the original table, we create a new table that contains just the keys, (UserID, OrderID, ProductName, ShopName). The (OrderID, UserID) table is removed on account of redundancy.

Resultant tables:

R1 (OrderID, ProductName, ShopName, Status, Delivery-Date)

R2 (UserID, ProductName, ShopName, Rate-Date-Time, Rating)

R3 (UserID, OrderID, ProductName, ShopName)

4. Employees (EmployeeID, Salary, Name)

Key: (EmployeeID)

FDs: EmployeeID -> Salary, Name

Table is already in 3NF, as only two attributes are involved.

5. Products (ProductName, Maker, Category)

Key: (ProductName)

FDs: ProductName -> Maker, Category

Table is in 3NF, as the LHS contains the key of the table.

6. Shops (ShopName)

Key: (ShopName)

Table is already in 3NF.

7. Product-in-shops (ShopName, ProductName, Price, Stock)

Key: (ShopName, ProductName)

FDs: ShopName, ProductName -> Price, Stock

Table is in 3NF, as the LHS contains the key of the table.

8. Price-History (ShopName, ProductName, Start-date, End-date, Price)

Key: (ShopName, ProductName, Start-Date)

FDs: ShopName, ProductName, Start-Date -> End-Date, Price

Assumption: For every Start-Date, the product would have a corresponding End-Date. If the price is the current price of the product, End-Date would be NULL.

Table is in 3NF, as the LHS contains the key of the table.

9. Comments (UserID, CommentID, Text)

Key: (CommentID)

FDs: CommentID -> UserID, Text

Table is in 3NF, as the LHS contains the key of the table.

10. Comments-on-product (CommentID, UserID, OrderID, ProductName, ShopName)

Keys: (CommentID, OrderID)

FDs: CommentID \rightarrow UserID, ProductName, ShopName

OrderID \rightarrow UserID

This is not in 3NF, as the LHS of the non-trivial FDs do not contain the key nor do the RHS of the FDs contain a part of the LHS.

Following the 3NF decomposition algorithm:

The FDs are already in minimal basis. Create a table for each of the FDs, since none of the tables contain the key of the original table, we create a new table that contains just the keys, (CommentID, OrderID)

Resultant tables:

R1(CommentID, UserID, ProductName, ShopName)

R2 (OrderID, UserID)

R3 (CommentID, OrderID)

11. Comments-on-comments (CommentID, Comment2ID)

Key: (CommentID)

FD: CommentID \rightarrow Comment2ID

Assumption: CommentID refers to the reply comment and Comment2ID refers to the original comment that is being replied to.

The relation is already in 3NF, as the LHS contains the key.

12. Complaints (ComplaintID, Status, Text, Filing-time-date, UserID, EmployeeID, Address, Date-time)

Key: (ComplaintID)

FDs: ComplaintID \rightarrow Status, Text, Filing time-date, UserID, EmployeeID, Address, Date-time

The table is already in 3NF, as the LHS contains the key.

13. Complaints-on-comments (ComplaintID, CommentID)

Key: (ComplaintID)

FD: ComplaintID \rightarrow CommentID

The table is already in 3NF, as the LHS contains the key.

14. Complaints-on-shops (ComplaintID, ShopName)

Key: (ComplaintID)

FD: ComplaintID \rightarrow ShopName

The table is already in 3NF, as the LHS contains the key.

15. Complaints-on-products (ComplaintID, ProductName)

Key: (ComplaintID)

FD: ComplaintID \rightarrow ProductName

The table is already in 3NF, as the LHS contains the key.