

Proof that relations are in Boyce-Codd Normal Form

1. 'Users' relation :

- Attributes :

Users {UserID, Name, Password, Email, Phone_no, IS_premium_user, City, Location}

- Functional dependencies :

UserID \rightarrow Name

UserID \rightarrow Password

UserID \rightarrow Email

UserID \rightarrow Phone_no

UserID \rightarrow IS_premium_user

UserID \rightarrow City

UserID \rightarrow Location

Let X = UserID

X⁺ = {UserID, Name, Password, Email, Phone_no, IS_premium_user, City, Location}

Thus, **Primary key = UserID**

The left side of all the FDs in the minimal set of FDs for the relation 'Users' is UserID, which is the primary key of this relation, so **"Users" is in BCNF.**

2. 'Restaurant' relation :

- Attributes :

Restaurant {RestaurantID, Name, contact_no, City, Adress}

- Functional dependencies :

RestaurantID \rightarrow Name

RestaurantID \rightarrow contact_no

RestaurantID \rightarrow City

RestaurantID \rightarrow Adress

Let X = RestaurantID

$X^+ = \{\text{RestaurantID}, \text{Name}, \text{contact_no}, \text{City}, \text{Adress}\}$

Thus, **Primary key = RestaurantID**

The left side of all the FDs in a minimal set of FDs for the relation

'Restaurant' is RestaurantID, which is the primary key of this relation, so

"Restaurant" is in BCNF.

3. 'Category' relation :

- Attributes :

Category {CategoryID, Name}

- Functional dependencies
: CategoryID \rightarrow Name

Let $X = \text{CategoryID}$

$X^+ = \{\text{CategoryID}, \text{Name}\}$

Thus, **Primary key = CategoryID**

The left side of all the FDs in minimal set of FDs for the relation 'Category' is CategoryID, which is the primary key of this relation, so

"Category" is in BCNF.

4. 'Items' relation :

- Attributes :

Items{ItemID, Name, Price, Preparation_time, CategoryID, RestaurantID }

- Functional dependencies :

ItemID \rightarrow Name

ItemID \rightarrow Price

ItemID \rightarrow Preparation_time
ItemID \rightarrow CategoryID
ItemID \rightarrow RestaurantID

Let X = ItemID

X+ = {ItemID, Name, Price, Preparation_time, CategoryID, RestaurantID }

Thus, **Primary key = ItemID**

The left side of all the FDs in minimal set of FDs for the relation 'Items' is ItemID, which is the primary key of this relation, so **"Items" is in BCNF.**

5. 'Delievery_Guy' relation :

- Attributes :

Delievery_Guy{Delievery_partner_ID, Name, Location, PhoneNumber, VehicleNumber}

- Functional dependencies :

Delievery_partner_ID \rightarrow Name

Delievery_partner_ID \rightarrow Location

Delievery_partner_ID \rightarrow PhoneNumber

Delievery_partner_ID \rightarrow VehicleNumber

Let X = Delievery_partner_ID

X+ = {Delievery_partner_ID, Name, Location, PhoneNumber, VehicleNumber}

Thus, **Primary key = Delievery_partner_ID**

The left side of all the FDs in minimal set of FDs for the relation 'Delievery_Guy' is Delievery_partner_ID, which is the primary key of this relation, so

"Delievery_Guy" is in BCNF.

6. 'Payment' relation :

- Attributes :

Payment{PaymentID, Payment_Method, Amount}

PaymentID \rightarrow Payment_Method

PaymentID \rightarrow Amount

Let X = PaymentID

X+ = {PaymentID, Payment_Method, Amount}

Here **Primary key = PaymentID**

According to theorem, all attribute primary key relation is always in BCNF.

Hence **“Payment” is in BCNF.**

7. ‘Orders’ relation :

- Attributes :

Orders {OrderID, Order_status,
DATE, UserID, PaymentID, Delievery_partner_ID
Delievery_Adress}

- Functional dependencies :

OrderID \rightarrow Order_status

OrderID \rightarrow DATE

OrderID \rightarrow UserID

OrderID \rightarrow PaymentID

OrderID \rightarrow Delievery_Adress

OrderID \rightarrow Delievery_partner_ID

Let X = OrderID

X⁺ = {OrderID, Order_status,
DATE, UserID, PaymentID, Delievery_partner_ID, Delievery_Adress}

Thus, **Primary key = OrderID**

The left side of all the FDs in minimal set of FDs for the relation ‘Orders’ is OrderID, which is the primary key of this relation, so **“Orders” is in BCNF.**

8. ‘Ordered_item’ relation :

- Attributes :

Ordered_item {OrderID, ItemID, Quantity}

- Functional dependencies :

{OrderID, ItemID} \rightarrow Quantity

Let X = {OrderID, ItemID}

X⁺ = {OrderID, ItemID, Quantity}

Thus, **Primary key = {OrderID, ItemID}**

The left side of all the FDs in minimal set of FDs for the relation ‘Ordered_item’ is {OrderID, ItemID}, which is the primary key of this relation, so **“Ordered_item” is in BCNF.**

9. 'Item_Ratings' relation :

- Attributes :

Item_Ratings{UserID,ItemID,Ratings}

- Functional dependencies :

$\{UserID, ItemID\} \rightarrow Ratings$

Let $X = \{UserID, ItemID\}$

$X^+ = \{UserID,ItemID,Ratings\}$

Thus, **Primary key = {UserID, ItemID}**

The left side of all the FDs in minimal set of FDs for the relation 'Item_Ratings' is {UserID, ItemID} , which is the primary key of this relation, so **"Item_Ratings" is in BCNF.**

10. 'Restaurant_Ratings' relation :

- Attributes :

Restaurant_Ratings{UserID,RestaurantID,Ratings}

- Functional dependencies :

$\{UserID, RestaurantID\} \rightarrow Ratings$

Let $X=\{UserID, RestaurantID\}$

$X^+ = \{UserID, Restaurant ID,Ratings\}$

Thus, **Primary key = {UserID, RestaurantID}**

The left side of all the FDs in minimal set of FDs for the relation

'Restaurant_ratings' is {UserID, RestaurantID}, which is the primary key of this relation, so **"Restaurant_ratings" is in BCNF.**

11. 'Offer' relation :

- Attributes :

Offer{OfferID, Offername}

- Functional dependencies :

OfferID \rightarrow Offername

Let X = OfferID

X⁺ = {OfferID, Offername}

Thus, **Primary key = OfferID**

The left side of all the FDs in minimal set of FDs for the relation 'Offer' is

OfferID, which is the primary key of this relation, so **"Offer" is in BCNF.**

12. 'Have_offer' relation :

- Attributes :

Have_offer {RestaurantID, OfferID}

Thus, **Primary key = {RestaurantID, OfferID}**

The left side of all the FDs in minimal set of FDs for the relation 'Have_offer' is {RestaurantID, OfferID} which is the primary key of this relation, so **"Have_offer" is in BCNF.**