- Normal forms are used to measure the **"goodness"** of a relation.
- 4 Types: 1NF , 2NF , 3NF and BCNF(Boyce-Codd Normal Form)

- **Conditions to check relation is in BCNF or not:**
  1. First find a minimum Fd's set Fmin.
  2. Then find key for the given Fd's set.
  3. If in all Fd's left side is a key then we say BCNF otherwise not.

- **Conditions to check relation is in 3NF or not:**
  1. First find a minimum Fd's set Fmin.
  2. Then find key for the given Fd's set.
  3. If in all Fd's left side is a key or right side is a prime attribute then we say 3NF otherwise not.

- ## User Relation:

User : (**<u>User_Id</u>**, Name, Gender, Date_Of_Birth, Area, City, State, Phone_No, Email, password)

F_{min} :

User_Id -> Name

User_Id -> Gender

User_Id -> Date_Of_Birth

User_Id -> Area

User_Id -> City

User_Id -> Password

User_Id -> Phone_No

User_Id -> State

User_Id -> Email

Let we choose X = { User_Id }. And find closure of X.

X^+ = {User_Id,Name,Gender, Date_Of_Birth,Area,City,State,Phone_No,Email,password }

In here X^+ contains all attributes of relation.

Thus, **Primary key** = {User_Id }.

For every FD's A → B in F_{min} , A is a key.

So we say that User is in **BCNF**.

- **Movies Relation:**

Movies : (**Movie_Name**,**Release_Date** ,Movie_Duration , Budget)

F_{min} :

{ Movie_Name, Release_Date } -> Movie_Duration

{ Movie_Name, Release_Date } -> Budget

Let we choose X = { Movie_Name, Release_Date }. And find closure of X.

X^+ = { Movie_Name,Release_Date ,Movie_Duration , Budget }

In here X^+ contains all attributes of relation.

Thus, **Primary key** = { Movie_Name, Release_Date }.

For every FD's A → B in F_{min} , A is a key.

So we say that Movies is in **BCNF**.

- **Theatre Relation:**

Theatre : (**Theatre_Id**, Theatre_Name, No_Of_Screens, Helpline_NO, Theatre_Owner_Name, Area, City, State, Rating)

F_{min} :

Theatre_Id -> Theatre_Name

Theatre_Id -> No_Of_Screens

Theatre_Id -> Area

Theatre_Id -> City

Theatre_Id -> Helpline_NO

Theatre_Id -> State

Theatre_Id -> Theatre_Owner_Name

Theatre_Id -> Rating

Let we choose X = { Theatre_Id }. And find closure of X.

X^+ = { Theatre_Id, Theatre_Name, No_Of_Screens, Helpline_NO, Theatre_Owner_Name, Area, City, State, Rating }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Theatre_Id }.

For every FD's A → B in F_{min} , A is a key.

So we say that Theatre is in **BCNF**.

- ## Artist Relation:

Atrist : (**Artist_Id**, Name, Gender, DOB, No_Of_Movies, Networth, Spouse)

F_{min} :

Artist_Id -> Name

Artist_Id -> No_Of_Movies

Artist_Id -> Gender

Artist_Id -> Networth

Artist_Id -> DOB

Artist_Id -> Spouse

Let we choose X = { Artist_Id }. And find closure of X.

X^+ = { Artist_Id, Name, Gender, DOB, No_Of_Movies, Networth, Spouse }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Artist_Id }.

For every FD's $A \rightarrow B$ in F_{min} , A is a key.

So we say that Artist is in **BCNF**.

- ## Role Relation:

Role: (**Role_Name, Movie_Name, Release_Date, Artist_Id**)

Let we choose X ={ Role_Name, Movie_Name, Release_Date, Artist_Id }. And find closure of X.

X^+ = { Role_Name, Movie_Name, Release_Date, Artist_Id }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Role_Name, Movie_Name, Release_Date, Artist_Id }.

There is **no FD** in this relation because **key contains all attributes** of the relation.

So we say that Role is in **BCNF**.

- ## Genre Relation:

Genre: (**Movie_Name,Release_Date,Genre_Type**)

Let we choose X ={ Movie_Name,Release_Date,Genre_Type }. And find closure of X.

X^+ = { Movie_Name,Release_Date,Genre_Type }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Movie_Name,Release_Date,Genre_Type }.

There is **no FD** in this relation because **key contains all attributes** of the relation.

So we say that Genre is in **BCNF**.

- **Language Relation:**

Language: (**Movie_Name,Release_Date,Language_Name**)

Let we choose X ={ Movie_Name,Release_Date,Language_Name }. And find closure of X.

X^+ = { Movie_Name,Release_Date,Language_Name }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Movie_Name,Release_Date,Language_Name }.

There is **no FD** in this relation because **key contains all attributes** of the relation.

So we say that Language is in **BCNF**.

- **Show Relation:**

Show: (**Show_Id**, Show_Date, Show_Time, Screen_No, Movie_Name, Release_Date, Theatre_Id, Cost_Of_Silver_Class, Cost_Of_Gold_Class, Cost_Of_Diamond_Class)

F_{min} :

Show_Id -> Show_Date	Show_Id -> Show_Time
Show_Id -> Screen_No	Show_Id -> Movie_Name
Show_Id -> Release_Date	Show_Id -> Theatre_Id
Show_Id -> Cost_Of_Silver_Class	Show_Id -> Cost_Of_Gold _Class
Show_Id -> Cost_Of_Diamond _Class	

Let we choose X = { Show_Id }. And find closure of X.

X^+ = { Show_Id, Show_Date, Show_Time, Screen_No, Movie_Name, Release_Date, Theatre_Id, Cost_Of_Silver_Class, Cost_Of_Gold_Class, Cost_Of_Diamond_Class }

In here X^+ contains all attributes of relation.

Thus, **Primary key** = { Show_Id }.

For every FD's A → B in F_{min} , A is a key.

So we say that Show is in **BCNF**.

- ## Seat Relation:

Seat: (**Seat_No, Screen_No, Theatre_Id**, Type_Of_Seat)

F_{min} :

{ Seat_No, Screen_No, Theatre_Id }-> Type_Of_Seat

Let we choose X = { Seat_No, Screen_No, Theatre_Id }. And find closure of X.

X^+ = { Seat_No, Screen_No, Theatre_Id, Type_Of_Seat }

In here X^+ contains all attributes of relation.

Thus Primary key = { Seat_No, Screen_No, Theatre_Id }.

For every FD's A → B in F_{min} , A is a key.

So we say that Seat is in **BCNF**.

- ## Screen Relation:

Screen : (**Screen_No, Theatre_Id**, Total_No_Of_Silver_Seats, Total_No_Of_Gold_Seats, Total_No_Of_Diamond_Seats)

F_{min} :

{ Screen_No, Theatre_Id } -> Total_No_Of_Silver_Seats

{ Screen_No, Theatre_Id } -> Total_No_Of_Diamond_Seats

{ Screen_No, Theatre_Id } -> Total_No_Of_Gold_Seats

Let we choose X = { Screen_No, Theatre_Id }. And find closure of X.

X^+ = { Screen_No, Theatre_Id, Total_No_Of_Silver_Seats, Total_No_Of_Gold_Seats, Total_No_Of_Diamond_Seats }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Screen_No, Theatre_Id }.

For every FD's A → B in F_{min} , A is a key.

So we say that Screen is in **BCNF**.

- ## Reviews Relation:

Reviews : (**User_Id, Movie_Name, Release_Date**, Rating, Comments)

F_{min} :

{ User_Id, Movie_Name, Release_Date } -> Rating

{ User_Id, Movie_Name, Release_Date } -> Comments

Let we choose X = { User_Id, Movie_Name, Release_Date }. And find closure of X.

X^+ = { User_Id, Movie_Name, Release_Date, Rating, Comments }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { User_Id, Movie_Name, Release_Date }.

For every FD's A → B in F_{min} , A is a key.

So we say that Reviews is in **BCNF**.

- ## Booking Relation:

Booking: (**Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id**, User_UPI_ID, Theatre_UPI_ID)

F_{min} :

{ Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id } -> User_UPI_ID

{ Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id } -> Theatre_UPI_ID

{ Show_Id } -> { Theatre_Id }

{ Show_Id } -> { Screen_No}

Let we choose X = { Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id }. And find closure of X.

X^+ = { Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id, User_UPI_ID, Theatre_UPI_ID }

In here X^+ contains all attributes of relation.

Thus **Primary key** = { Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id }.

There are total 4 FD's In **F_{min} .**

For **some** FD's A → B in F_{min} , A is a key.

Rest of the FD's A->B where A is not a key then B is Prime attribute.

Prime attributes: { Theatre_Id, Screen_No, Seat_No, User_Id, Show_Id }

In 3rd FD Theatre_Id and 4th Screen_No both are prime attributes.

So we say that Reviews is in **3NF**.