INDIAN PREMIER LEAGUE (IPL)

DATABASE

GROUP 3

TEAM ID – 308

Professor -- PM Jat

Mentor TA -- Prachi Singh

Contact Details(Kashyap) -- 7984640820

NAME	ID
KASHYAP TRIVEDI	202201191
PARTHIV VAGHANI	202201249
JAY RATHOD	202201255

NORMALIZATION PROOFS

To check that our Relation is in BCNF,

1. **Identify Functional Dependencies:** Examine the functional dependencies within the table. These are dependencies between attributes, where the value of one attribute determines the value of another.
2. **Identify Candidate Keys:** Determine the candidate keys of the table. A candidate key is a minimal set of attributes that uniquely identifies each tuple in the table. All other attributes must be functionally dependent on the candidate keys.
3. **Provide Proof:** Once you've identified all functional dependencies and candidate keys, provide a formal proof for each non-trivial dependency, demonstrating that the determinant (X) is indeed a superkey.

1. 'PLAYER' relation:

- Attributes:

  PLAYER {Player_ID, Name, Role, Country, DOB}

- Functional dependencies:
  Player_ID → Name
  Player_ID → Role
  Player_ID → Country
  Player_ID → DOB

- Let X=Player_ID
- Now Let's take the closure of it,
- X^+= {Player_ID, Name, Role, Country, DOB} Thus, **Primary Key is Player_ID.**
- Every non-key attribute must be fully determined by the whole primary key, not just a part of it. As we saw, each non-key attribute in this table solely relies on the Player_ID for its value.
- **Since in this Minimal Set of FDs, the left side in all of the FDs is Player_ID which is Candidate-key of this relation.**
- **Therefore, 'PLAYER' is in BCNF.**

2. 'TEAM' Relation :

- Attributes:

  TEAM {Team_Name, Year, Owner, Coach, Captain}

- Functional dependencies:

  {Team_Name, Year} → Owner

  {Team_Name, Year} → Coach

  {Team_Name, Year} → Captain

- Let X= {Team_Name, Year}
- Now Let's take the closure of it,
- X^+= {Team_Name, Year, Owner, Coach, Captain}
- Thus, **Primary Key=** {Team_Name, Year}
- The left side of all the FDs in minimal set of FDs for the relation 'TEAM' is

{Team_Name, Year}, which is the primary key of this relation, so

- **“TEAM” is in BCNF**.

3.” SPONSOR_DETAILS” Relation :

- Attributes :

  SPONSOR_DETAILS {Company_Name, Country, CEO}

- Functional dependencies: Company_Name → Country

  Company_Name → CEO

- Let X= {Company_Name}
- Now Let’s take the closure of it, ○ X^+= {Company_Name, Country, CEO}
- Thus, **Primary Key**= {Company_Name}
- The left side of all the FDs in minimal set of FDs for the relation ”SPONSOR_DETAILS” is {Company_Name}, which is the primary key of this relation, so
- **”SPONSOR_DETAILS” is in BCNF.**

4. ” STADIUM” Relation :

- Attributes :

  STADIUM {Ground_Name, City, Gold_Seat, Silver_Seat, Bronze_Seat}

- Functional dependencies:

  Ground_Name → City

  Ground_Name → Gold_Seat

  Ground_Name → Silver_Seat

  Ground_Name → Bronze_Seat

- Let X= {Ground_Name}
- Now Let’s take the closure of it,

- X^+={Ground_Name, City, Gold_Seat, Silver_Seat, Bronze_Seat}
- Thus, **Primary Key=** { Ground_Name }
- The left side of all the FDs in minimal set of FDs for the relation 'STADIUM is { Ground_Name }, which is the primary key of this relation, so
- **"STADIUM" is in BCNF.**

5. " USER"

- Attributes :

  USER {Email_ID, User_Name, Password, Position}

- Functional dependencies: Email_ID → User_Name

  Email_ID → Password

  Email_ID → Position

- Let X= { Email_ID }
- Now Let's take the closure of it, ○ X^+={Email_ID, User_Name, Password, Position}
- Thus, **Primary Key=**{ Email_ID }
- The left side of all the FDs in minimal set of FDs for the relation 'USER' is

  { Email_ID }, which is the primary key of this relation, so
- **"**USER**" is in BCNF.**

6. " STAT" Relation :

- Attributes :

  STAT {Player_ID, Year, Runs, Wickets, Catches, 4's, 6's, YO-YO_Score, Sold_Price, Strike_Rate, Economy}

- Functional dependencies:

  {Player_ID , Year} → Runs

  {Player_ID , Year}→ Wickets

  {Player_ID , Year} → Catches

  {Player_ID , Year} → 4's

  {Player_ID , Year} → 6's

{Player_ID , Year} → YO-YO_Score
{Player_ID , Year} → Sold_Price
{Player_ID , Year} → Strike_Rate
{Player_ID , Year} → Economy

- Let X= {Player_ID , Year }
- Now Let's take the closure of it,
- X^+= {Player_ID, Year, Runs, Wickets, Catches, 4's, 6's, YO-YO_Score,Sold_Price,Strike_Rate,Economy}
- Thus, **Primary Key=** {Player_ID , Year}
- The left side of all the FDs in minimal set of FDs for the relation 'STAT' is {Player_ID , Year}, which is the primary key of this relation, so
- "STAT**" is in BCNF.**

7. " PAST_MATCH" Relation :

- Attributes :

PAST_MATCH {Timestamp, Team_Name, Opponent_Team, Year, Ground_Name, Toss, Score1, Score2, Winner, Man_of_the_Match }

- Functional dependencies:

Timestamp → Team_Name

Timestamp → Opponent_Team

Timestamp → Year

Timestamp → Ground_Name

Timestamp → Toss

Timestamp → Score1 Timestamp

→ Score2

Timestamp → Winner

Timestamp → Man_of_the_Match

- Let X= {Timestamp}
- Now Let's take the closure of it,
- X^+= {Timestamp, Team_Name, Opponent_Team, Year, Ground_Name, Toss, Score1, Score2, Winner, Man_of_the_Match}
- Thus, **Primary Key=**{Timestamp}
- The left side of all the FDs in minimal set of FDs for the relation 'PAST_MATCH' is {Timestamp }, which is the primary key of this relation, so
- **"**PAST_MATCH**" is in BCNF.**

8. " PLAYER_SCOREBOARD" Relation :

- Attributes :

PLAYER_SCOREBOARD {Player_ID, Timestamp, Runs, Wickets, Catches, 4's, 6's,Strike_Rate,Economy}

- Functional dependencies:

{Player_ID, Timestamp} → Runs

{Player_ID, Timestamp} → Wickets {Player_ID,

Timestamp} → Catches

{Player_ID, Timestamp} → 4's {Player_ID,

Timestamp} → 6's

{Player_ID, Timestamp} → Strike_Rate

{Player_ID, Timestamp} → Economy

- Let X= {Player_ID, Timestamp}
- Now Let's take the closure of it,
- X^+= {Player_ID, Timestamp, Runs, Wickets, Catches, 4's, 6's,Strike_Rate,Economy}
- Thus, **Primary Key=**{ Player_ID, Timestamp}
- The left side of all the FDs in minimal set of FDs for the relation 'PLAYER_SCOREBOARD' is { Player_ID, Timestamp}, which is the primary key of this relation, so
- **"**PLAYER_SCOREBOARD**" is in BCNF.**

9. " IPL_SEASON" Relation :

- Attributes :

IPL_SEASON {Year, Winner, Runner_UP, Player_OF_The_Season, Orange_Cap, Purple_Cap}

- Functional dependencies:

Year → Winner

Year → Runner_UP

Year → Player_OF_The_Season

Year → Orange_Cap

Year → Purple_Cap

- Let X= {Year}
- Now Let's take the closure of it,
- X^+={Year, Winner, Runner_UP, Player_OF_The_Season, Orange_Cap, Purple_Cap}
- Thus, **Primary Key=**{ Year }
- The left side of all the FDs in minimal set of FDs for the relation 'IPL_SEASON' is {Year}, which is the primary key of this relation, so

- **“**IPL_SEASON**” is in BCNF.**

10. ” SEASON_SPONSOR” Relation :

- Attributes :

  SEASON_SPONSOR {Year, Company_Name, Sponsor_Type, Amount}

- Functional dependencies:

  {Year,Company_Name, Sponsor_Type} → Amount

- Let X= {Year, Company_Name, Sponsor_Type }
- Now Let’s take the closure of it,
- X^+={Year, Company_Name, Sponsor_Type, Amount}
- Thus, **Primary Key=**{Year, Company_Name, Sponsor_Type }
- The left side of all the FDs in minimal set of FDs for the relation ‘SEASON_SPONSOR’ is {Year, Company_Name, Sponsor_Type } which is the primary key of this relation, so
- **“**SEASON_SPONSOR**” is in BCNF.**

11. ” TEAM_SPONSOR” Relation :

- Attributes :

  TEAM_SPONSOR {Company_Name, Team_Name, Year, Amount}

- Functional dependencies:

  { Company_Name,Team_Name,Year} → Amount

- Let X= {Company_Name,Team_Name,Year }
- Now Let's take the closure of it,
- X^+={Company_Name, Team_Name, Year, Amount}
- Thus, **Primary Key=** { Company_Name,Team_Name,Year }
- The left side of all the FDs in minimal set of FDs for the relation 'TEAM_SPONSOR 'is { Company_Name,Team_Name,Year }, which is the primary key of this relation, so
- **"**TEAM_SPONSOR**" is in BCNF.**

12. "UPCOMING_MATCH" Relation :

- Attributes :

  UPCOMING_MATCH {Timestamp, Team_Name, Opponent_Team, Year, Gold_Price, Silver_Price, Bronze_Price, Ground_Name}

- Functional dependencies: Timestamp → Team_Name

  Timestamp → Opponent_Team
  Timestamp → Year

  Timestamp → Gold_Price

  Timestamp → Silver_Price

  Timestamp → Bronze_Price

  Timestamp → Ground_Name

- Let X= {Timestamp}
- Now Let's take the closure of it,

- X^+= {Timestamp, Team_Name, Opponent_Team, Year, Gold_Price, Silver_Price, Bronze_Price, Ground_Name}
- Thus, **Primary Key=**{ Timestamp}
- The left side of all the FDs in minimal set of FDs for the relation 'UPCOMING_MATCH ' is {Timestamp}, which is the primary key of this relation, so
- **"**UPCOMING_MATCH**" is in BCNF.**

13. " AUDIENCE" Relation :

- Attributes :
  AUDIENCE {Booking_ID, Gold_Seat, Silver_Seat, Bronze_Seat, Email_ID}
- Functional dependencies: Booking_ID → Gold_Seat

Booking_ID → Silver_Seat

Booking_ID → Bronze_Seat

Booking_ID → Email_ID

- Let X= {Booking_ID}
- Now Let's take the closure of it,
- X^+={Booking_ID, Gold_Seat, Silver_Seat, Bronze_Seat, Email_ID}
- Thus, **Primary Key=**{ Booking_ID }
- The left side of all the FDs in minimal set of FDs for the relation 'AUDIENCE 'is
- { Booking_ID }, which is the primary key of this relation, so
- **"**AUDIENCE**" is in BCNF.**

14."TEAM'S_PLAYER" RELATION

- Since, All attributes of this relation are primary key, By definition of BCNF, This is in BCNF.
  At first, this table was not in BCNF because there was attribute named Sold_Price.

- Attributes :
  TEAM'S_PLAYER {Player_ID, Team_Name, Year,Sold_Price}

- Functional dependencies:

  {Player_ID, Team_Name, Year} → Sold_Price

  {Player_ID, Year} → Sold_Price

- Let X= { Player_ID, Team_Name, Year}
- Now Let's take the closure of it,
- X^+={ Player_ID, Team_Name, Year,Sold_Price}
- Thus, **Primary Key=**{ Player_ID, Team_Name, Year }

Sold_Price is not FULLY FUNCTIONALLY DEPENDENT on Candidate key, so it violet 2NF condition thus, we **decomposed** this table into

R1 { Player_ID, Team_Name, Year}
R2 { Player_ID, Year, Sold_Price}

Now, Player_ID and Year was already present in STAT table so we include Sold_Price in that table to **reduce data redundancy**.

15. "TICKET_BOOKING" RELATION

- Since, All attributes of this relation are primary key, By definition of BCNF, This is in BCNF.