**Minimal FD set**

We have derived the minimal FD set such that all other FDs can be derived from the set of minimal FDs.

**FDs**

Player\_name -> Nationality

Player\_name -> Date\_Of\_Birth

Player\_name -> Bowling\_Style

Player\_name -> Batting\_Style

{Player\_Name,Match\_TimeStamp} -> Runs\_Scored

{Player\_Name,Match\_TimeStamp} -> Runs\_Conceided

{Player\_Name,Match\_TimeStamp} -> Wickets

{Player\_Name,Match\_TimeStamp} -> Fours

{Player\_Name,Match\_TimeStamp} -> Sixes

{Player\_Name,Match\_TimeStamp} -> Balls\_Faced

{Player\_Name,Match\_TimeStamp} -> Balls\_Bowled

{Player\_Name,Team\_Name, Year} -> Base\_Price

{Player\_Name,Team\_Name, Year} -> Final\_Price

{Player\_Name, Team\_Name, Year} -> Role

Match\_Timestamp -> Type

Match\_Timestamp -> Stadium\_Name

Match\_Timestamp -> Man\_Of\_The\_Match

Stadium\_Name -> Capacity

Stadium\_Name -> City

Official\_Name -> Salary

Official\_Name -> Experience

{Team\_Name,Year,Match\_TimeStamp} -> Result

Team\_Name -> Owner

{Team\_Name,Year} -> Coach\_Name

Coach\_Name -> Country

Coach\_Name -> Experience

Year -> Title\_Sponsor

**Proof of BCNF**

1. **Player**
   * **Schema**:  
     Player (Player\_name, Nationality, Date\_Of\_Birth, Bowling\_Style, Batting\_Style)
   * **FDs**:  
     • Player\_name → Nationality, Date\_Of\_Birth, Bowling\_Style, Batting\_Style
   * **Key**:  
     Player\_name⁺ = {Player\_name, Nationality, Date\_Of\_Birth, Bowling\_Style, Batting\_Style}  
     ⇒ Candidate key = {Player\_name}
   * **BCNF check**:  
     The only FD has left side = {Player\_name} which is the candidate key.  
     ⇒ Player is in BCNF.
2. **Performance**
   * **Schema**:  
     Performance(Player\_Name, Match\_TimeStamp, Runs\_Scored, Runs\_Conceided, Wickets, Fours, Sixes, Balls\_Faced, Balls\_Bowled)
   * **FDs**:  
     • {Player\_Name, Match\_TimeStamp} → Runs\_Scored, Runs\_Conceided, Wickets, Fours, Sixes, Balls\_Faced, Balls\_Bowled
   * **Key**:  
     {Player\_Name, Match\_TimeStamp}⁺ = all attributes of the relation  
     ⇒ Candidate key = {Player\_Name, Match\_TimeStamp}
   * **BCNF check**:  
     The FD’s left side is the candidate key.  
     ⇒ Performance is in BCNF.
3. **Match**
   * **Schema**:  
     Match(Match\_Timestamp, Type, Stadium\_Name, Man\_Of\_The\_Match)
   * **FDs**:  
     • Match\_Timestamp → Type, Stadium\_Name, Man\_Of\_The\_Match
   * **Key**:  
     Match\_Timestamp⁺ = {Match\_Timestamp, Type, Stadium\_Name, Man\_Of\_The\_Match}  
     ⇒ Candidate key = {Match\_Timestamp}
   * **BCNF check**:  
     The FD’s left side is the candidate key.  
     ⇒ Match is in BCNF.
4. **Stadium**
   * **Schema**:  
     Stadium(Stadium\_Name, Capacity, City)
   * **FDs**:  
     • Stadium\_Name → Capacity, City
   * **Key**:  
     Stadium\_Name⁺ = {Stadium\_Name, Capacity, City}  
     ⇒ Candidate key = {Stadium\_Name}
   * **BCNF check**:  
     Left side is the candidate key.  
     ⇒ Stadium is in BCNF.
5. **Official**
   * **Schema**:  
     Official(Official\_Name, Salary, Experience)
   * **FDs**:  
     • Official\_Name → Salary, Experience
   * **Key**:  
     Official\_Name⁺ = {Official\_Name, Salary, Experience}  
     ⇒ Candidate key = {Official\_Name}
   * **BCNF check**:  
     Left side is the candidate key.  
     ⇒ Official is in BCNF.
6. **Played\_By**
   * **Schema**:  
     Played\_By(Team\_Name, Year, Match\_TimeStamp, Result)
   * **FDs**:  
     • {Team\_Name, Year, Match\_TimeStamp} → Result
   * **Key**:  
     {Team\_Name, Year, Match\_TimeStamp}⁺ = all attributes  
     ⇒ Candidate key = {Team\_Name, Year, Match\_TimeStamp}
   * **BCNF check**:  
     FD’s left side is the candidate key.  
     ⇒ Played\_By is in BCNF.
7. **Team**
   * **Schema**:  
     Team(Team\_Name, Owner)
   * **FDs**:  
     • Team\_Name → Owner
   * **Key**:  
     Team\_Name⁺ = {Team\_Name, Owner}  
     ⇒ Candidate key = {Team\_Name}
   * **BCNF check**:  
     Left side is the candidate key.  
     ⇒ Team is in BCNF.
8. **Coach**
   * **Schema**:  
     Coach(Coach\_Name, Country, Experience)
   * **FDs**:  
     • Coach\_Name → Country, Experience
   * **Key**:  
     Coach\_Name⁺ = {Coach\_Name, Country, Experience}  
     ⇒ Candidate key = {Coach\_Name}
   * **BCNF check**:  
     Left side is the candidate key.  
     ⇒ Coach is in BCNF.
9. **Registers**
   * **Schema**:  
     Registers(Team\_Name, Year, Coach\_Name)
   * **FDs**:  
     • {Team\_Name, Year} → Coach\_Name
   * **Key**:  
     {Team\_Name, Year}⁺ = {Team\_Name, Year, Coach\_Name}  
     ⇒ Candidate key = {Team\_Name, Year}
   * **BCNF check**:  
     FD’s left side is the candidate key.  
     ⇒ Registers is in BCNF.
10. **Season**
    * **Schema**:  
      Season(Year, Title\_Sponsor)
    * **FDs**:  
      • Year → Title\_Sponsor
    * **Key**:  
      Year⁺ = {Year, Title\_Sponsor}  
      ⇒ Candidate key = {Year}
    * **BCNF check**:  
      Left side is the candidate key.  
      ⇒ Season is in BCNF.
11. **Played\_In**

* **Schema**

PlayedIn(Year, Team\_Name, Player\_Name, Base\_Price, Final\_Price, Role)

* **FDs:**
* {Team\_Name, Year, Player\_Name} -> Base\_Price
* {Team\_Name, Year, Player\_Name} ->Final\_Price
* {Team\_Name, Year, Player\_Name} ->Role
* **Key**

{Team\_Name, Year, Player\_Name}+ = {Year, Team\_Name,Player\_Name, Base\_Price, Final\_Price, Role}

* **BCNF**

Left side is the candidate key.  
⇒ Season is in BCNF.

**Overall Conclusion:**

Every non‑trivial FD in each relation has a left‑hand side that is a candidate key for that relation. Therefore **all** of the above relations are in BCNF.