BCNF decomposition

Page No.
Date

1) Users : Functional Dependency

- User_ID → First_Name, Last_Name, House_Address, Street, Landmark, Area, State, City
- House_Address → Street
- House_Address, Street → Landmark
- House_Address, Street → Area, City, State
- Area → City
- City → State

* Test of 1NF
  - There is no redundant attribute, as it is already decomposed into different table i.e Phone_No.
  - So it is 1NF

* Test of 2NF
  - It does not contains any partial dependency as in House_Address → Street, Street is in Prime Attribute as House_Address, Street → Landmark
  - So it is 2NF

* Test of 3NF
  - It has transitive dependency at Area → city & City → State which makes Area → state
  - To decompose in 3NF

→ Users_Data_Area (User_ID, First_Name, Last_Name, House_Address, Street, Landmark, Area)

→ Area_City (Area, City)

→ City_State (city, State)
→ All are in 3NF now.

* Test for BCNF
→ For User_data_Area
• User_data_Area (User_ID, First_name, Last_Name, House_Address, Street, Landmark, Area)
: Functional dependencies
- House_Addres → Street
- User_ID → First_name, Last_Name, House_Addr, Street, Landmark, Area

- House_Address, street → Landmark

- House_Address, street → Area

as House_Address is not a candidate key so we have to decompose in BCNF
> User_Names (User_ID, First_Name, Last_Name, House_Address, street)
> House_Address_Area (House_Address, street, Area)
(House_Address, street: combined Primary Key / candidate Key)
> House_Address_Landmark (House_Address, street, Landmark)

Now they are in BCNF

Page No.
Date

→ For Area_City

Area_city(Area, City)

↓ Candidate key

- Functional dependency
  - Area → City
    Candidate Key
    - As left side has candidate key so it is in BCNF

→ For City_State

City_State(City, State)

↓ C.key

- Functional dependency
  City → State
  Candidate Key
  - As left side is candidate key so it is BCNF.

2) Membership : Functional Dependencies

Plan_type → Plan cost

↓

Candidate key

as There is no ~~redundant~~ multivalued Attribute, no partial & transitive dependency & Left side of the Functional dependencies is Candidate key so it is BCNF

3) Appoints : Functional Dependencies

Mem_ID → Ins_ID, Time_Appointed, Time_till

as there is no ~~redundant~~ multivalued Attribute, no partial & transitive dependency & Left side of the Functional dependency {Mem_ID} is candidate key so it is in BCNF

4) Member : Functional Dependencies

- User_ID → Mem_ID, First_Name, Last_Name, Plan_Type, Start_Date, End_Date Ins_Appointed.

- Mem_ID → User_ID, First_Name, Last_Name, Plan_Type, Start_Date, End_Date, Ins_Appointed

As there are no ~~red~~ multivalued attribute, no partial & transitive dependency & Left side of Functional dependency {User_ID, Mem_ID) are candidate keys, so it is in BCNF

5) Phone_No

It was a multivalued attribute of Users table, which decomposed to 1NF to reduce redundancy.

Functional Dependencies

- User_ID, Phone_NOs → Phone_NOs

As both the the Attributes combined, are candidate key {User_ID, Phone_NOs} and also, Phone_Nos is Prime Attribute so it satisfies BCNF

6) Email_ID

It was a multivalued attribute of Personal_Instructor table, which decomposed to 1NF to reduce redundancy

Functional Dependencies

- Ins_ID → Email_ID → Email_ID

As both the Attribute combined are candidate key {Ins_ID, Email_ID} and also, Email_ID is a Prime Attribute so it satisfies BNF

Page No.
Date

7) Personal_Instructor : Functional Dependency

- User_ID → Ins_ID, First_Name, Last_Name, Ins_Fees,

- Ins_ID → User_ID, First_Name, Last_Name, Ins_Fees

→ As {User_ID, Ins_ID} are candidate keys and on the left side of functional dependencies, and it has no multivalued Attribute, no transitive, and partial dependencies & so it is in BCNF

8). Register : Functional Dependencies

- Reg_ID → Mem_ID, First_Name, Last_Name, Register_Day, Entry_Time, Exit_Time

As {Reg_ID} is the candidate key on the left side of functional dependencies & it has no multivalued attribute, no transitive & partial dependencies so it is a in BCNF

9) Monthly_Analysis : Functional Dependencies

- Analysis_ID → Mem_ID, Month_Name, weight_change, Fat_Percentage

As Candidate key is {Analysis_ID} on the left side of ~~FDs~~ Functional Dependencies

& it has no multivalued attribute &
no partial & transitive dependencies
so it satisfies BCNF.