Group No. 18

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Dairy product management system

➢FD Closure and Normal form for all relations :-

1. **Customer :-**
   - **➢ Attributes :-**
     - C_Mobile_no, C_First_Name, C_Last_Name, C_Locality, C_Pincode, C_City, Worker_id
   - **➢ FDs :-**
     - C_Mobile_no → C_First_Name
     - C_Mobile_no → C_Last_Name
     - C_Mobile_no → C_Locality
     - C_Mobile_no → C_Pincode
     - C_Mobile_no → C_City
     - C_Mobile_no → Worker_id
   - **➢ Closure :-**
     - $[C\_Mobile\_no]^+$ = {C_Mobile_no, C_First_Name, C_Last_Name, C_Locality, C_Pincode, C_City, Worker_id}
     - $[C\_First\_Name]^+$ = {C_First_Name}
     - $[C\_Last\_Name]^+$ = {C_Last_Name}
     - $[C\_Locality]^+$ = {C_Locality}
     - $[C\_Pincode]^+$ = {C_Pincode}
     - $[C\_City]^+$ = {C_City}
     - $[Worker\_id]^+$ = {Worker_id}
   - **➢ Candidate key :-**
     - Here we can see that the closure set of C_Mobile_no contains all attributes.

- So C_Mobile_no can be the primary key of Customer relation.

➢ **Normal form :-**

- Here the determinant of all FDs is C_Mobile_no and here C_Mobile_no is the primary key.
- So we can say that this relation is in BCNF.

2. **Sellers :-**

➢ **Attributes :-** Seller_id, S_first_name, S_Last_name, S_company_name, S_Mobile_no

➢ **FDS :-**

- Seller_id → S_first_name
- Seller_id → S_Last_name
- Seller_id → S_company_name
- Seller_id → S_Mobile_no

➢ **Closure :-**

- $[Seller\_id]^+$ = {Seller_id, S_first_name, S_Last_name, S_company_name, S_Mobile_no}
- $[S\_first\_name]^+$ = {S_first_name}
- $[S\_Last\_name]^+$ = {S_Last_name}
- $[S\_company\_name]^+$ = {S_company_name}
- $[S\_Mobile\_no]^+$ = {S_Mobile_no}

➢ **Candidate key :-**

- Here we can see that the closure set of Seller_id contains all attributes.
- So Seller_id can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is Seller_id and here Seller_id is the primary key.
- So we can say that this relation is in BCNF.

3. **Workers :-**

➢ **Attributes :-** Worker_id, W_First_name, W_Last_name, W_Address, W_birthdate, W_joining_date, W_salary

➢ **FDs :-**

- Worker_id → W_First_name
- worker_id → W_Last_name
- worker_id → W_Address
- worker_id → W_birthdate
- worker_id → W_joining_date
- worker_id → W_salary

➢ **Closure :-**

- $[Worker\_id]^+$ = {Worker_id, W_First_name, W_Last_name, W_Address, W_birthdate, W_joining_date, W_salary}
- $[W\_First\_name]^+$ = {W_First_name}
- $[W\_Last\_name]^+$ = {W_Last_name}
- $[W\_Address]^+$ = {W_Address}
- $[W\_birthdate]^+$ = {W_birthdate}
- $[W\_joining\_date]^+$ = {W_joining_date}
- $[W\_salary]^+$ = {W_salary}

➢ **Candidate key :-**

- Here we can see that the closure set of Worker_id contains all attributes.
- So Worker_id can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is Worker_id and here Worker_id is the primary key.
- So we can say that this relation is in BCNF.

4. **Working**

➢ **Attributes :-**

- W_worker_id , W_outlet_code

➢ **FDs :-**

- Here we get only trivial FDs because a combination of both attributes can only determine one another.

➢ **Closure :-**

- [W_worker_id , W_outlet_code]+ = {W_worker_id , W_outlet_code}

- [W_worker_id]+ = {W_worker_id}
- [W_outlet_code]+ = {W_outlet_code}

➢ **Candidate key :-**

- Here we can see that the closure set of {W_worker_id , W_outlet_code} contains all attributes.
- So {W_worker_id , W_outlet_code} can be the primary key of this relation.

➢ **Normal form :-**

- Normal Form theorem :- All attributes are key attributes in a relation then relation is always in BCNF.
- So we can say that this relation is in BCNF.

5. WORKER_ MOBILE_ NUMBER

➢ **Attributes :-**

- WMN_WORKER_KEY, WMN_MOBILE_NO

➢ **FDs :-**

- Here we get only trivial FDs because a combination of both attributes can only determine one another.

➢ **Closure :-**

- [WMN_WORKER_KEY,WMN_MOBILE_NO]+ = {WMN_WORKER_KEY, WMN_MOBILE_NO}
- [WMN_WORKER_KEY]+ = {WMN_WORKER_KEY}
- [WMN_MOBILE_NO]+ = {WMN_MOBILE_NO}

➢ **Candidate key :-**

- Here we can see that the closure set of {WMN_WORKER_KEY,WMN_MOBILE_NO} contains all attributes.
- So {WMN_WORKER_KEY,WMN_MOBILE_NO} can be the primary key of this relation.

➢ **Normal form :-**

- Normal Form theorem :- All attributes are key attributes in a relation then relation is always in BCNF.
- So we can say that this relation is in BCNF.

6. **Manager :-**
   - ➢ **Attributes :-**
     - M_worker_id, M_user_name, M_password
   - ➢ **FDs :-**
     - M_worker_id → M_user_name
     - M_worker_id → M_password
     - M_user_name → M_worker_id
     - M_user_name → M_password
   - ➢ **Closure :-**
     - [M_worker_id]+ = {M_worker_id, M_user_name, M_password}
     - [M_user_name]+ = {M_worker_id, M_user_name, M_password}
     - [M_password]+ = {M_password}
   - ➢ **Candidate key :-**
     - Here we can see that the closure set of M_worker_id and M_user_name contains all attributes.
     - So M_worker_id and M_user_name are candidate keys.
     - So M_worker_id can be the primary key of this relation.
   - ➢ **Normal form :-**
     - Here the determinant of all FDs is M_worker_id or M_user_name and here M_worker_id and M_user_name are candidate keys.
     - So we can say that this relation is in BCNF.
7. **Product :-**

➢ **Attributes :-** Product_id, P_name, P_Company_name, P_Tax, P_Unit_price, P_Quantity, P_Profit, seller_id

➢ **FDs :-**

- Product_id → P_name
- Product_id → P_Company_name
- Product_id → P_Tax
- Product_id → P_Unit_price
- Product_id → P_Quantity
- Product_id → P_Profit
- Product_id → seller_id

➢ **Closure :-**

- $[Product\_id]^+$ = {Product_id, P_name, P_Company_name, P_Tax, P_Unit_price, P_Quantity, P_Profit, seller_id}
- $[P\_name]^+$ = {P_name}
- $[P\_Company\_name]^+$ = {P_Company_name}
- $[P\_Tax]^+$ = {P_Tax}
- $[P\_Unit\_price]^+$ = {P_Unit_price}
- $[P\_Quantity]^+$ = {P_Quantity}
- $[P\_Profit]^+$ = {P_Profit}
- $[seller\_id]^+$ = {seller_id}

➢ **Super key :-**

- Here we can see that the closure set of Product_id contains all attributes.
- So Product_id can be the super key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is Product_id and here Product_id super keys.
- So we can say that this relation is in BCNF.

8. Include Product

➢ **Attributes :-** I_bill_id, I_Product_id,I_QUANTITY

➢ **FDs :-**

- Here we get only trivial FDs because a combination of both attributes can only determine one another.

➢ **Closure :-**

- [I_bill_id, I_Product_id]+ = {I_bill_id, I_Product_id,I_QUANTITY}
- [I_bill_id]+ = {I_bill_id}
- [I_Product_id]+ = {I_Product_id}
- [I_QUANTITY]+={I_QUANTITY}

➢ **Candidate key:-**

- Here we can see that the closure set of {I_bill_id, I_Product_id} contains all attributes.
- So {I_bill_id, I_Product_id} can be the primary key of this relation.

➢ **Normal form :-**

- Normal Form theorem :- All attributes are key attributes in a relation then relation is always in BCNF.
- So we can say that this relation is in BCNF.

9. **Milk :-**

➢ **Attributes :-** M_Product_id, M_fat, M_type, M_total_quantity

➢ **FDs :-**

- {M_Product_id} → {M_fat, M_type, M_total_quantity}

➢ **Closure :-**

- [M_Product_id]+ = {M_Product_id, M_type, M_fat, M_total_quantity}
- $[M\_fat]^+ = \{M\_fat\}$
- [M_type]+ = {M_type}
- $[M\_total\_quantity]^+ = \{M\_total\_quantity\}$

➢ **Candidate key :-**

- Here we can see that the closure set of M_Product_id contains all attributes.

- So M_Product_id can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is M_Product_id and here M_Product_id is a primary key.
- So we can say that this relation is in BCNF.

10. **Bill :-**

➢ **Attributes :-** bill_id, B_Payment_type, B_Total amount, B_Total tax, B_Date, C_Mo. no, O_code

➢ **FDs :-**

- bill_id → B_Payment_type
- bill_id → B_Total amount
- bill_id → B_Total tax
- bill_id → B_Date
- bill_id → C_Mo. no
- bill_id → O_code

➢ **Closure :-**

- [bill_id]+ = {bill_id, B_Payment_type, B_Total amount, B_Total tax, B_Date, C_Mo. no, O_code}
- [B_Payment_type]+ = {B_Payment_type}
- [B_Total amount]+ = {B_Total amount}
- [B_Total tax]+ = {B_Total tax}
- [B_Date]+ = {B_Date}
- [C_Mo. no]+ = {C_Mo. no}
- [O_code]+ = [O_code]

➢ **Candidate key :-**

- Here we can see that the closure set of bill_id contains all attributes.
- So bill_id can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is bill_id and here bill_id is a primary key.
- So we can say that this relation is in BCNF.

11. Feedback :-

➢ **Attributes :-** F_Title, Customer_Mo_no. , F_Rating, F_comment

➢ **FDs :-**

- {Customer_Mo_no.} → F_Rating
- {Customer_Mo_no.} → F_comment
- {Customer_Mo_no.} → F_Title

➢ **Closure :-**

- [Customer_Mo_no.]+ = {F_Title, Customer_Mo_no. , F_Rating, F_comment}
- [F_Title]+ = {F_Title}
- [F_Rating]+ = {F_Rating}
- [F_comment]+ = {F_comment}

➢ **Candidate key :-**

- Here we can see that the closure set of Customer_Mo_no contains all attributes.
- So Customer_Mo_no can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is Customer_Mo_no and here Customer_Mo_no is the primary key.
- So we can say that this relation is in BCNF.

12. Purchase report :-

➢ **Attributes :-** PR_Date, Seller_id, Outlet_code, payment_type, PR_total_amount

➢ **FDs :-**

- {PR_Date, Seller_id, Outlet_code} → payment_type
- {PR_Date, Seller_id, Outlet_code} → PR_total_amount

➢ **Closure :-**

- [PR_Date, Seller_id, Outlet_code]$^+$ = {PR_Date, Seller_id, Outlet_code, payment_type, PR_total_amount}
- [PR_Date]$^+$ = {PR_Date}
- [Seller_id]$^+$ = {Seller_id}
- [Outlet_code]$^+$ = {Outlet_code}
- [Payment_type]$^+$ = {Payment_type}
- [PR_total_amount]$^+$ = {PR_total_amount}

➢ **Candidate key :-**

- Here we can see that the closure set of {PR_Date, Seller_id, Outlet_code} contains all attributes.
- So {PR_Date, Seller_id, Outlet_code} can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is {PR_Date, Seller_id, Outlet_code} and here {PR_Date, Seller_id, Outlet_code} is the primary key.
- So we can say that this relation is in BCNF.

13. Selling report :-

➢ **Attributes :-**

- SR_Date,SR_PRODUCT_CODE, Outlet_code, SR_total_quantity, SR_total_amount, SR_total_profit

➢ **FDs :-**

- {SR_Date,SR_PRODUCT_CODE, Outlet_code} → SR_total_quantity
- {SR_Date,SR_PRODUCT_CODE, Outlet_code} → SR_total_amount
- {SR_Date,SR_PRODUCT_CODE, Outlet_code} → SR_total_profit

➢ **Closure :-**

- [SR_Date,SR_PRODUCT_CODE, Outlet_code]$^+$ = {SR_Date,SR_PRODUCT_CODE, Outlet_code,

SR_total_quantity, SR_total_amount, SR_total_profit}

- $[SR\_Date]^+ = \{SR\_Date\}$
- $[SR\_PRODUCT\_CODE]^+ = \{SR\_PRODUCT\_CODE\}$
- $[Outlet\_code]^+ = \{Outlet\_code\}$
- $[SR\_total\_quantity]^+ = \{SR\_total\_quantity\}$
- $[SR\_total\_amount]^+ = \{SR\_total\_amount\}$
- $[SR\_total\_profit]^+ = \{SR\_total\_profit\}$

➢ **Candidate key :-**

- Here we can see that the closure set of {SR_Date,SR_PRODUCT_CODE, Outlet_code} contains all attributes.
- So {SR_Date,SR_PRODUCT_CODE, Outlet_code} can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is {SR_Date,SR_PRODUCT_CODE, Outlet_code} and here {SR_Date,SR_PRODUCT_CODE, Outlet_code} is the primary key.
- So we can say that this relation is in BCNF.

14. Outlet :-

➢ **Attributes :-**

- Outlet_code, O_starting_date, O_Address

➢ **FDs :-**

- Outlet_code → O_starting_date
- Outlet_code → O_Address

➢ **Closure :-**

- $[Outlet\_code]^+ = \{Outlet\_code, O\_starting\_date, O\_Address\}$
- $[Outlet\_starting\_date]^+ = \{Outlet\_starting\_date\}$
- $[O\_Address]^+ = \{O\_Address\}$

➢ **Candidate key :-**

- Here we can see that the closure set of Outlet_code contains all attributes.
- So Outlet_code can be the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is Outlet_code and here Outlet_code is the primary key.
- So we can say that this relation is in BCNF.

15. **Outlet mobile number**

➢ **Attributes :-**

- OMN_outlet_code,OMN_Mobile no

➢ **Fds :-**

- Here we get only trivial FDs because a combination of both attributes can only determine one another.

➢ **Closure :-**

- **[**OMN_outlet_code,OMN_Mobile no**]**+ = {OMN_outlet_code,OMN_Mobile no}
- [OMN_outlet_code]+ = {OMN_outlet_code}
- [OMN_Mobile no]+ = {OMN_Mobile no }

➢ **Candidate key :-**

- Here we can see that the closure set of {OMN_outlet_code,OMN_Mobile no} contains all attributes.
- So {OMN_outlet_code,OMN_Mobile no}can be the primary key of this relation.

➢ **Normal form :-**

- Normal Form theorem :- All attributes are key attributes in a relation then relation is always in BCNF.
- So we can say that this relation is in BCNF.

16. **Transport :-**

➢ **Attributes :-**

- Transport_id, Driver_First_name, Driver_Last_name, T_Date, Address, T_Total_amount, merchant_first_name, merchant_last_name, merchant_mobile_no, T_bill_id, T_worker_id

➢ **Fds :-**

- Transport_id → Driver_First_name
- Transport_id → Driver_Last_name
- Transport_id → T_Date
- Transport_id → Address
- Transport_id → T_Total_amount
- Transport_id → merchant_first_name
- Transport_id → merchant_last_name
- Transport_id → merchant_mobile_no
- Transport_id → T_bill_id
- Transport_id → T_worker_id
- T_bill_id → Driver_First_name
- T_bill_id → Driver_Last_name
- T_bill_id → T_Date
- T_bill_id → Address
- T_bill_id → T_Total_amount
- T_bill_id → merchant_first_name
- T_bill_id → merchant_last_name
- T_bill_id → merchant_mobile_no
- T_bill_id → Transport_id
- T_bill_id → T_worker_id

➢ **Closure :-**

- $[Transport\_id]^+$ = {Transport_id, Driver_First_name, Driver_Last_name, T_Date, Address, T_Total_amount, merchant_first_name, merchant_last_name, merchant_mobile_no, T_bill_id, T_worker_id}
- $[Driver\_First\_name]^+$ = {Driver_First_name}

- [Driver_Last_name]$^+$ = {Driver_Last_name}
- [T_Date]$^+$ = {T_Date}
- [Address]$^+$ = {Address}
- [T_Total_amount]$^+$ = {T_Total_amount}
- [merchant_first_name]$^+$ = {merchant_first_name}
- [merchant_last_name]$^+$ = {merchant_last_name}
- [merchant_mobile_no]$^+$ = {merchant_mobile_no}
- [T_worker_id]$^+$ = {T_worker_id}
- [T_bill_id]$^+$ = {Transport_id, Driver_First_name, Driver_Last_name, T_Date, Address, T_Total_amount, merchant_first_name, merchant_last_name, merchant_mobile_no, T_bill_id, T_worker_id}

➢ **Candidate key :-**

- Here we can see that the closure set of Transport_id and T_bill_id contains all attributes.
- So Transport_id and T_bill_id are candidate keys.
- So here we choose Transport_id for the primary key of this relation.

➢ **Normal form :-**

- Here the determinant of all FDs is Transport_id or T_bill_id and here Transport_id and T_bill_id are candidate keys.
- So we can say that this relation is in BCNF.

➢List update, delete, and insert anomalies in original database design :-

➢ Here our schema is in BCNF because all relations are in BCNF.

➢ So we can say that if we update, delete and insert anomalies in the original database we can’t find any redundancy.