Database Management System Project

Group Id:- **T612** Lab Group No:- **6**

Topic Name:- **e-Bay**

- **Functional Dependencies and Proof that Relations are in Boyce-Codd Normal Form(BCNF) :-**

(1) **User_Profile**

Attributes:- { Email , Password , first_name , last_name }

Email → Password
Email → first_name
Email → last_name

- Let's take the closure of Email:-

$Email^{+}$ = { Email , Password , first_name , last_name }

Candidate-Key:- Email

Primary-Key:- Email

- Since in this Minimal Set of FDs, the left side in all of the FDs is **Email which is Candidate-Key** of this relation
  Therefore, "User_Profile" is in BCNF

(2) **User**

Attributes:- { User_id , Email }

User_id → Email

- Let's take the closure of User_id:-

  $User\_id^{+}$ = { User_id , Email }

Candidate-Key:- User_id
Primary-Key:- User_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is **User_id which is Candidate-Key** of this relation
  Therefore, "User" is in BCNF

(3) **Seller**

Attributes:- { User_id , item_sold,Avg_Rating , A/C_Number }

User_id → item_sold
User_id → Avg_Rating
User_id → A/C_Number

- Let's take the closure of User_id:-

  $User\_id^{+}$ = { User_id , item_sold,Avg_Rating , A/C_Number }

  Candidate-Key:- User_id
  Primary-Key:- User_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is **User_id which is Candidate-Key** of this relation
  Therefore, "Seller" is in BCNF

(4) **Bank_Details**

Attributes:- { A/C_Number , Balance }

A/C_Number → Balance

- Let's take the closure of A/C_Number:-

  A/C_Number^{+} = { A/C_Number , Balance }

  Candidate-Key:- A/C_Number
  Primary-Key:- A/C_Number

- Since in this Minimal Set of FDs, the left side in all of the FDs is **A/C_Number which is Candidate-Key** of-
  this relation.**Therefore, "Bank_Details" is in BCNF**

(5) **Product**

Attributes:- { Product_id , Product_Name , Watching_Number ,Available_Units , Price , Description , Avg_Rating , Product_Seller_id }

Product_id → Product_Name
Product_id → Watching_Number
Product_id → Available_Units
Product_id → Price
Product_id → Description
Product_id → Avg_Rating
Product_id → Product_Seller_id

- Let's take the closure of Product_id:-

  $Product\_id^{+}$ = { Product_id , Product_Name , Watching_Number ,Available_Units , Price , Description , Avg_Rating , Product_Seller_id }

  Candidate-Key:- Product_id
  Primary-Key:- Product_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is **Product_id which is Candidate-Key** of this relation.
  Therefore, "Product" is in BCNF

(6) Product_Review

Attributes:- { Product_id , User_id , Rating , Comment }

{Product_id , User_id } → Rating
{Product_id , User_id } → Comments

- Let's take the closure of { Product_id, User_id }:-

$\{Product\_id , User\_id\}^{+}$ = {Product_id, User_id, Rating, Comment}

Candidate-Key:- { Product_id, User_id }
Primary-Key:- { Product_id , User_id }

- Since in this Minimal Set of FDs, the left side in all of the FDs is **{ Product_id, User_id } which is Candidate-Key** of this relation. **Therefore, "Product_Review" is in BCNF**

(7) **Order**

Attributes:- { Order_id , Order_Date , Shipping_Cost , Buyer_User_id , Transaction_id ,Shipping_Address_User_id, Total_order_cost }

Order_id → Order_Date
Order_id → Shipping_Cost
Order_id → Buyer_User_id
Order_id → Transaction_id
Order_id → Shipping_User_id
Order_id → Total_order_cost
Transaction_id → Order_id
Transaction_id → Order_Date
Transaction_id → Shipping_Cost
Transaction_id → Buyer_id
Transaction_id → Shipping_User_id
Transaction_id → Total_order_cost

- Let's take the closure of Order_id and Transaction_id:-

$Order\_id^{+}$ = { Order_id , Order_Date , Shipping_Cost , Buyer_User_id , Transaction_id ,Shipping_Address_User_id, Total_order_cost }

$Transaction\_id^{+}$ = { Order_id , Order_Date , Shipping_Cost , Buyer_User_id , Transaction_id ,Shipping_Address_User_id, Total_order_cost }

Candidate-Keys:- Order_id , Transaction_id
Primary-Key:- Order_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is Either Order_id or Transaction_id **which are Candidate-Keys** of this relation. **Therefore, "Order" is in BCNF**

(8) **Shipping_Status**

Attributes:- { tracking_id , Est_Delivery_Date , Delivered_Date , Delivery_Status , Order_id }

tracking_id → Est_Delivery_Date
tracking_id → Delivered_Date
tracking_id → Delivery_Status
tracking_id → Order_id
Order_id → Est_Delivery_Date
Order_id → Delivered_Date
Order_id → Delivery_Status
Order_id → tracking_id

- Let's take the closure of Order_id and tracking_id:-

$Order\_id^{+}$ = { tracking_id , Est_Delivery_Date , Delivered_Date , Delivery_Status, Order_id }

$tracking\_id^{+}$ = { tracking_id , Est_Delivery_Date, Delivered_Date , Delivery_Status, Order_id }

Candidate-Keys:- Order_id , tracking_id
Primary-Key:- tracking_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is Either Order_id or tracking_id **which are Candidate-Keys** of this relation. **Therefore, "Shipping_Status" is in BCNF**

(9) **Shipper**

Attributes:- { Shipper_id , Inv_House_Name , Shipper_Name }

Shipper_id → Inv_House_Name
Shipper_id → Shipper_Name

- Let's take the closure of Shipper_id:-

  $Shipper\_id^{+}$ = { Shipper_id , Inv_House_Name , Shipper_Name }

  Candidate-Key:- Shipper_id
  Primary-Key:- Shipper_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is **Shipper_id which is Candidate-Key** of this relation.
  Therefore, "Shipper" is in BCNF

(10) **Shipper_Phone_No**

Attributes:- { Shipper_id , Phone_No }

Phone_No → Shipper_id

- Let's take the closure of Phone_No:-

  $Phone\_No^{+}$ = { Shipper_id , Phone_No }

  Candidate-Key:- Phone_No
  Primary-Key:- {Shipper_id , Phone_No}

- Since in this Minimal Set of FDs, the left side in all of the FDs is **Phone_No which is Candidate-Key** of this relation.
  Therefore, "Shipper_Phone" is in BCNF

(11) **Inv_Phone_No**

Attributes:- { **Inv_House_Name,Inv_Phone_No** }

Inv_Phone_No → Inv_House_Name

- Let's take the closure of Inv_Phone_No:-

  $Inv\_Phone\_No^{+}$ = { Inv_House_Name , Inv_Phone_No }

  Candidate-Key:- Inv_Phone_No
  Primary-Key:- { Inv_House_Name,Inv_Phone_No }

- Since in this Minimal Set of FDs, the left side in all of the FDs is **Inv_Phone_No which is Candidate-Key** of this relation. **Therefore, "Inv_Phone_No" is in BCNF**

(12) **Shipping_Address**

Attributes:- { User_id , Apartment_Name , City , Street , State , Pincode , Is_Default }

User_id → Apartment_Name
User_id → City
User_id → Street
User_id → State
User_id → Pincode
User_id → Is_Default

- Let's take the closure of User_id:-

  $User\_id^{+}$ = { User_id , Apartment_Name , City , Street , State , Pincode , Is_Default }

Candidate-Key:- User_id
Primary-Key:- User_id

- Since in this Minimal Set of FDs, the left side in all of the FDs is **User_id which is Candidate-Key** of this relation.
  Therefore, "Shipping_Address" is in BCNF

(13) **User_Phone**

Attributes:- { User_id , Phone_No }

Phone_No → User_id

- Let's take the closure of Phone_No:-

  $Phone\_No^{+}$ = { User_id , Phone_No }

Candidate-Key:- Phone_No
Primary-Key:- {User_id , Phone_No}

- Since in this Minimal Set of FDs, the left side in all of the FDs is **Phone_No which is Candidate-Key** of this relation.
  Therefore, "User_Phone" is in BCNF

(14) **Contains**

Attributes:- { User_id , Product_id }

- There does not exist any Functional Dependency
  Primary_Key:- { User_id , Product_id }
- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(15) **Cart**

Attributes:- { User_id }

- There does not exist any Functional Dependency

Primary_Key:- { User_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(16) **Buyer**

Attributes:- { User_id}

- There does not exist any Functional Dependency

Primary_Key:- { User_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(17) **Product_Image**

Attributes:- {image_url, Product_id }

- There does not exist any Functional Dependency

Primary_Key:- {image_url, Product_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(18) **Has_Category**

Attributes:- {Category_Name, Product_id }

- There does not exist any Functional Dependency

Primary_Key:- { Category_Name ,Product_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(19) **Category**

Attributes:- { Category_Name }

- There does not exist any Functional Dependency

Primary_Key:- { Category_Name }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(20) **Category_Has_Subcategory**

Attributes:- { Category_Name, Subcategory_Name }

- There does not exist any Functional Dependency

Primary_Key:- { Category_Name, Subcategory_Name }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(21) **Subcategory**

Attributes:- { Subcategory_Name }

- There does not exist any Functional Dependency

Primary_Key:- { Subcategory_Name }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(22) **Has_Subcategory**

Attributes:- { Subcategory_Name, Product_id }

- There does not exist any Functional Dependency

Primary_Key:- { Subcategory_Name, Product_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(23) Payment

Attributes:- { Transaction_id }

- There does not exist any Functional Dependency

Primary_Key:- { Transaction_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(24) Watches

Attributes:- { User_id , Product_id }

- There does not exist any Functional Dependency

Primary_Key:- { User_id , Product_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(25) Has_Order

Attributes:- { Order_id , Product_id }

- There does not exist any Functional Dependency

Primary_Key:- { Order_id , Product_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(26) Delivers

Attributes:- { Shipper_id , Order_id }

- There does not exist any Functional Dependency

Primary_Key:- { Shipper_id , Order_id }

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**

(27) **Inv_House**

Attributes:- { Inv_House_Name}

- There does not exist any Functional Dependency

Primary_Key:- { Inv_House_Name}

- **Since there does not exist any FD , Therefore the relation "Contains" is in BCNF**