NORMALIZATION PROOFS

1. **'Customer' Relation:**

   Attributes: {CustID, Password, Fname, Mname, Lname, DOB}

   Functional Dependencies:

   CustID → Password

   CustID → Fname

   CustID → Mname

   CustID → Lname

   CustID → DOB

   Let X = CustID
   X+ = {CustID, Password, Fname, Mname, Lname, DOB}
   Thus, **Primary key = CustID**

   The left side of all the FDs in the minimal set of FDs for the relation 'Customer' is CustID, which is the primary key of this relation, so "Customer" is in **BCNF**.

2. **'Emergency_Contact' Relation:**

   Attributes: {Contact_Name, CustID, Address, Relation, Contact_Number}

   Functional Dependencies :

   { Contact_Name, CustID } → Address

   { Contact_Name, CustID } → Relation

   { Contact_Name, CustID } → Contact_Number

   Let X = { Contact_Name, CustID }
   X+ = { Contact_Name, CustID, Address, Relation, Contact_Number }
   Thus, **Primary key = { Contact_Name, CustID }**

The left side of all the FDs in the minimal set of FDs for the relation ‘Emergency_Contact’ is { Contact_Name, CustID }, which is the primary key of this relation, so “Emergency_Contact” is in **BCNF**.

3. **‘Customer_Contact’ Relation:**

   Attributes: {CustID, Contact}

   Primary key = {CustID, Contact}

   There are no Functional Dependencies in this relation as the only two attributes are CustID and Contact, which itself are the primary key.

   Thus, the relation “Customer_Contact” is in **BCNF**.

4. **‘Customer_Email’ Relation:**

   Attributes: {CustID, Email}

   Primary key = {CustID, Email}

   There are no Functional Dependencies in this relation as the only two attributes are CustID and Email, which itself are the primary key.

   Thus, the relation “Customer_Email” is in **BCNF**.

5. **‘Review’ Relation:**

   Attributes: { CustID, R_Type, Rating, Text, R_Date }

   Functional Dependencies :

{ CustID, R_type } → Rating

{ CustID, R_type } → Text

{ CustID, R_type } → R_Date

Let X = { CustID, R_type }
X+ = { CustID, R_Type, Rating, Text, R_Date }
Thus, **Primary key = { CustID, R_type }**

The left side of all the FDs in the minimal set of FDs for the relation 'Review' is { CustID, R_type }, which is the primary key of this relation, so "Review" is in **BCNF**.

6. **'Payment' Relation:**

Attributes: { TransactionID, Method, Amount, Transaction_Date, Transaction_Status, CustID, BookingID, DID, AdminID }

Functional Dependencies:

TransactionID → Method

TransactionID → Amount

TransactionID → Transaction_Date

TransactionID → Transaction_Status

TransactionID → CustID

TransactionID → BookingID

TransactionID → DID

TransactionID → AdminID

Let X = TransactionID
X+ = { TransactionID, Method, Amount, Transaction_Date, Transaction_Status, CustID, BookingID, DID, AdminID }
Thus, **Primary key = TransactionID**

The left side of all the FDs in the minimal set of FDs for the relation 'Payment' is TransactionID, which is the primary key of this relation, so "Payment" is in **BCNF**.

7. 'Booking' Relation:

Attributes : { BookingID, Booking_Date, Booking_Status, Total_Cost, No_of_Guests, Checkin_Date, Checkout_Date, CustID, DID, AdminID }

Functional Dependencies :

BookingID → Booking_Date

BookingID → Booking_Status

BookingID → Total_Cost

BookingID → No_of_Guests

BookingID → Checkin_Date

BookingID → Checkout_Date

BookingID → CustID

BookingID → DID

BookingID → AdminID

Let X = BookingID
X+ = { BookingID, Booking_Date, Booking_Status, Total_Cost, No_of_Guests, Checkin_Date, Checkout_Date, CustID, DID, AdminID }
Thus, the **Primary key = BookingID**

The left side of all the FDs in the minimal set of FDs for the relation 'Booking' is BookingID, which is the primary key of this relation, so "Booking" is in **BCNF**.

8. 'Admin' Relation:

Attributes : { AdminID, Password, Type, Fname, Mname, Lname }

Functional Dependencies :

AdminID → Password

AdminID → Type

AdminID → Fname

AdminID → Mname

AdminID → Lname

Let X = AdminID
X+ = { AdminID, Password, Type, Fname, Mname, Lname }
Thus, **Primary key = AdminID**

The left side of all the FDs in the minimal set of FDs for the relation 'Admin' is AdminID, which is the primary key of this relation, so "Admin" is in **BCNF**.

9. 'Admin_Contact' Relation:

Attributes : { AdminID, Contact }

Primary key = { AdminID, Contact }

There are no Functional Dependencies in this relation as the only two attributes are AdminID and Contact, which itself are the primary keys.

Thus the relation "Admin_Contact" is in **BCNF**.

10. 'Admin_Email' Relation:

Attributes : { AdminID, Email }

Primary key = { AdminID, Email }

There are no Functional Dependencies in this relation as the only two

attributes are AdminID and Email, which itself are the primary key.

Thus the relation “Admin_Email” is in **BCNF**.

11. ‘Non_logged_in_user’ Relation:

Attributes : { User_Name, DID }

Primary key = { User_Name, DID }

There are no Functional Dependencies in this relation as the only two attributes are User_Name and DID, which itself are the primary key.

Thus the relation “Non_logged_in_user” is in **BCNF**.

12. ‘EventsAndFests’ Relation:

Attributes : { DID, Event_Name, Event_Date, Description }

Functional Dependencies :

{ DID, Event_Name, Event_Date } → Description

Let X = { DID, Event_Name, Event_Date }
X+ = { DID, Event_Name, Event_Date, Description }
Thus, **Primary key = { DID, Event_Name, Event_Date }**

The left side of all the FDs in the minimal set of FDs for the relation ‘EventsAndFests’ is { DID, Event_Name, Event_Date }, which is the primary key of this relation, so “EventsAndFests” is in **BCNF**.

13. ‘Popular_Attractions’ Relation:

Attributes : { Popular_Attractions, DID }

Primary key = { Popular_Attractions, DID }

There are no Functional Dependencies in this relation as the only two attributes are Popular_Attractions and DID, which itself are the primary key.

Thus the relation “Popular_Attractions” is in **BCNF**.

14. ‘Destination’ Relation:

Attributes: { DID, Dname, Country, Description, Best_month_to_visit}

Functional Dependencies :

DID → Dname

DID → Country

DID → Description

DID → Best_month_to_visit

Let X = DID
X+ = { DID, Dname, Country, Description, Best_month_to_visit }
Thus, **Primary key = DID**

The left side of all the FDs in the minimal set of FDs for the relation ‘Destination’ is DID, which is the primary key of this relation, so “Destination” is in **BCNF**.

15. ‘Transportation’ Relation:

Attributes : { TransportationID, Price, Capacity, Trans_Type, DID, AdminID }

Functional Dependencies:

TransportationID → Price

TransportationID → Capacity

TransportationID → Trans_Type

TransportationID → DID

TransportationID → AdminID

Let X = TransportationID
X+ = {TransportationID, Price, Capacity, Trans_Type, DID, AdminID}
Thus, the **Primary key = TransportationID**

The left side of all the FDs in the minimal set of FDs for the relation 'Transportation' is TransportationID, which is the primary key of this relation, so "Transportation" is in **BCNF**.

16. 'Accommodation' Relation:

Attributes: {AccommodationID, Atype, Price_per_night, Aname, Availability, Docs_Required, DID, AdminID}

Functional Dependencies:

AccommodationID → Atype

AccommodationID → Price_per_night

AccommodationID → Anime

AccommodationID → Availability

AccommodationID → Docs_Required

AccommodationID → DID

AccommodationID → AdminID

Let X = AccommodationID
X+ = {AccommodationID, Atype, Price_per_night, Aname, Availability, Docs_Required, DID, AdminID}

Thus, **Primary key = AccommodationID**

The left side of all the FDs in the minimal set of FDs for the relation 'Accommodation' is AccommodationID, which is the primary key of this relation, so "Accommodation" is in **BCNF**.

17. 'Activities' Relation:

Attributes: {ActivityID, Activity_Name, Activity_Type, Price, Duration, Availability, DID, AdminID}

Functional Dependencies:

ActivityID → Activity_Name

ActivityID → Activity_Type

ActivityID → Price

ActivityID → Duration

ActivityID → Availability

ActivityID → DID

ActivityID → AdminID

Let X = ActivityID
X+ = {ActivityID, Activity_Name, Activity_Type, Price, Duration, Availability, DID, AdminID}

Thus, **Primary key =** ActivityID

The left side of all the FDs in the minimal set of FDs for the relation 'Activities' is ActivityID, which is the primary key of this relation, so "Activities" is in **BCNF**.

18. 'Refund' Relation:

Attributes : { Refund_Status, BookingID, TransactionID }

Primary key = { Refund_Status, BookingID, TransactionID }

There are no Functional Dependencies in this relation as the only two attributes are Refund_Status, BookingID, and TransactionID which are the primary key.

Thus, the relation “Refund” is in **BCNF**.