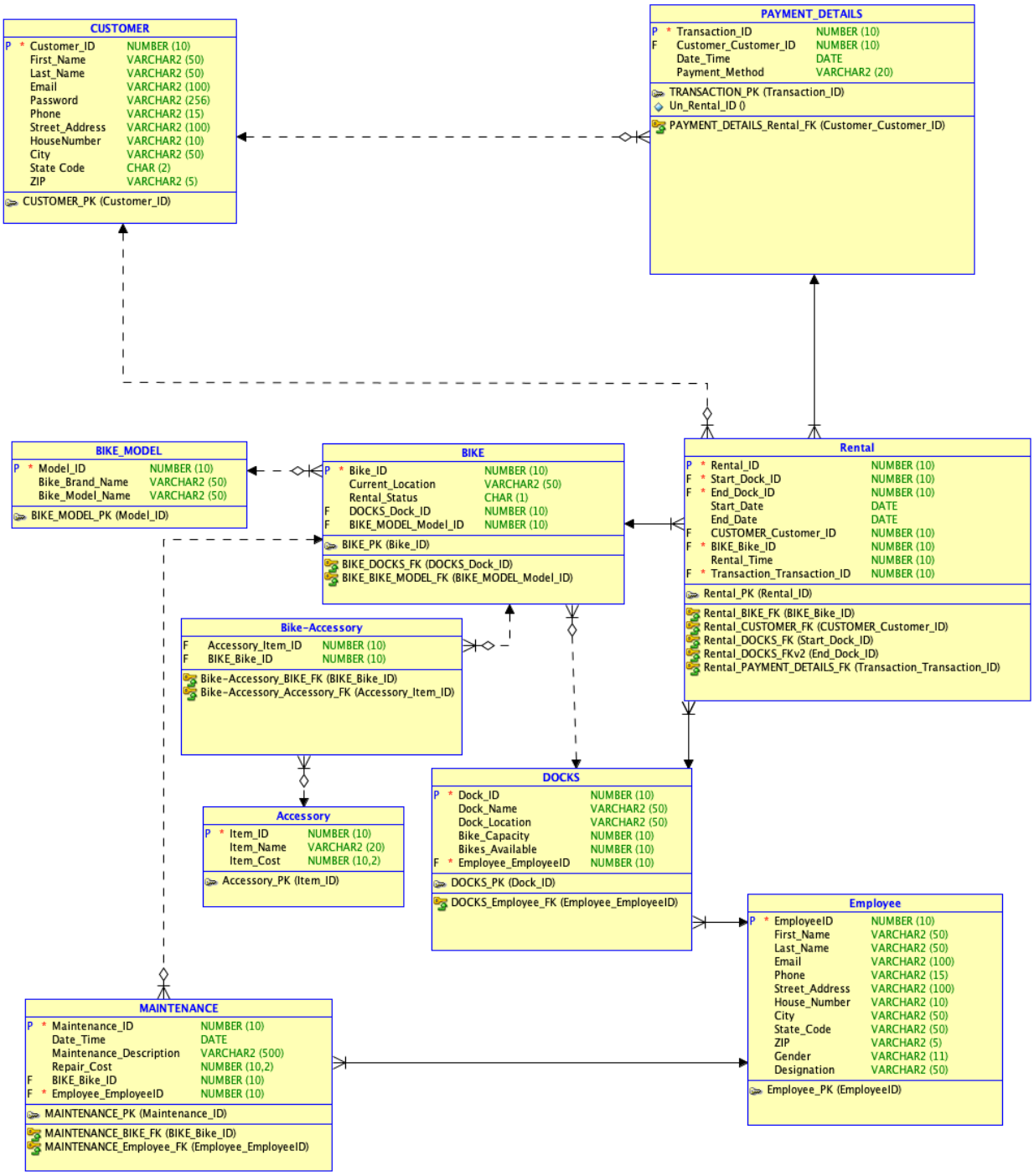
Final ER Diagram:



Normalization Process:

To normalize the provided data table up to 3NF we will first break the table to 1NF and then further to 2NF and then followed by 3NF.
This step-by-step process will finally result in data being normalized in some normal form, maintain relationships and remove exceptions.

Step 1: First Normal Form(1NF)

- All attributes contain atomic values.
- No repeating groups or arrays.
- Flat structure with redundancy.

To ensure the database satisfies 1NF, we create flat tables by combining related entities into larger tables. This eliminates relationships between tables but introduces redundancy. Here are the consolidated tables:

Customer_Rental Table

This table contains the customer, rental and payment in this table.

Column Name	Data Type
Customer_ID	NUMBER (10)
First_Name	VARCHAR2 (50)
Last_Name	VARCHAR2 (50)
Email	VARCHAR2 (100)
Password	VARCHAR2 (256)
Phone	VARCHAR2 (15)
Street_Address	VARCHAR2 (100)
HouseNumber	VARCHAR2 (10)
State_Code	CHAR (2)
ZIP	NUMBER (5)
Transaction_ID	VARCHAR2 (10)

Column Name	Data Type
Date_Time	DATE
Rental_Time	NUMBER (10)
Payment_Method	VARCHAR2 (20)
Rental_ID	NUMBER (10)
Start_Dock_ID	NUMBER (10)
End_Dock_ID	NUMBER (10)
Start_Date	DATE
End_Date	DATE

Bike_Info Table

This table contains bike and bike model details.

Column Name	Data Type
Bike_ID	NUMBER (10)
Model_ID	NUMBER (10)
Bike_Brand_Name	VARCHAR2 (50)
Bike_Model_Name	VARCHAR2 (50)
Current_Location	VARCHAR2 (50)
Rental_Status	CHAR (1)

Dock_Maintenance Table

This table contains Dock and maintenance details.

Column Name	Data Type
Dock_ID	NUMBER (10)
Dock_Name	VARCHAR2 (50)
Dock_Location	VARCHAR2 (25)
Bike_Capacity	NUMBER (10)
Bikes_Available	NUMBER (10)
Maintenance_ID	NUMBER (10)
Date_Time	DATE
Description	VARCHAR2 (500)
Repair_Cost	NUMBER (10,2)

Employee Table

The Employee table remains unchanged because it already satisfies 1NF.

Step 2: Second Normal Form(2NF)

To achieve **2NF**, we ensure:

1. The database is already in **1NF**.
2. All **non-prime attributes** (attributes that are not part of the primary key) are fully functionally dependent on the entire primary key (i.e., no partial dependencies).

In this step, we remove partial dependencies by decomposing tables where necessary. Below are the changes:

Customer_Rental Table:

In 1NF, Customer_Rental had partial dependencies because attributes like First_Name, Last_Name, etc., depended only on Customer_ID and not on the composite key (Customer_ID, Rental_ID). To fix this:

- Split Customer_Rental into two tables:
    1. **Customer Table**: Contains customer-specific attributes.
    2. **Rental_Payment Table**: Contains rental and payment-related attributes.

Customer Table:

Column Name	Data Type
Customer_ID	NUMBER (10)
First_Name	VARCHAR2 (50)
Last_Name	VARCHAR2 (50)
Email	VARCHAR2 (100)
Password	VARCHAR2 (256)
Phone	VARCHAR2 (15)
Street_Address	VARCHAR2 (50)

Column Name	Data Type
HouseNumber	VARCHAR2 (10)
State_Code	CHAR (2)
ZIP	VARCHAR2 (5)

Rental_Payment Table:

Column Name	Data Type
Rental_ID	NUMBER (10)
Customer_ID	NUMBER (10)
Transaction_ID	VARCHAR2 (36)
Start_Dock_ID	NUMBER (10)
End_Dock_ID	NUMBER (10)
Start_Date	DATE
End_Date	DATE

Bike_Info Table:

In 1NF, Bike_Info had partial dependencies because attributes
like Bike_Brand_Name and Bike_Model_Name depended only on Model_ID and not on the composite key (Bike_ID, Model_ID). To fix this:

- Split Bike_Info into two tables:
    1. **Bike_Model Table**: Contains model-specific attributes.
    2. **Bike Table**: Contains bike-specific attributes.

Bike_Model Table:

Column Name	**Data Type**
Model_ID	NUMBER (10)
Bike_Brand_Name	VARCHAR2 (50)
Bike_Model_Name	VARCHAR2 (50)

Bike Table:

Column Name	**Data Type**
Bike_ID	NUMBER (10)
Model_ID	NUMBER (10)
Current_Location	VARCHAR2 (50)
Rental_Status	CHAR (1)

Dock_Maintenance Table

In 1NF, Dock_Maintenance had partial dependencies because attributes like Dock_Name, Location, etc., depended only on Dock_ID and not on the composite key (Dock_ID, Maintenance_ID). To fix this:

- Split Dock_Maintenance into two tables:
    1. **Docks Table**: Contains dock-specific attributes.
    2. **Maintenance Table**: Contains maintenance-specific attributes.

Docks Table:

Column Name	Data Type
Dock_ID	NUMBER (10)
Dock_Name	VARCHAR2 (50)
Location	VARCHAR2 (25)
Bike_Capacity	NUMBER (10)
Bikes_Available	NUMBER (10)

Maintenance Table:

Column Name	Data Type
Maintenance_ID	NUMBER (10)
Dock_ID	NUMBER (10)
Date_Time	DATE
Description	VARCHAR2 (500)
Repair_Cost	NUMBER (10,2)

Step 3: Third Normal Form(3NF)

To achieve 3NF, we ensure:

1. The database is already in 2NF.
2. There are no transitive dependencies (i.e., non-prime attributes should not depend on other non-prime attributes).

In this step, we eliminate transitive dependencies by further decomposing tables where necessary. Based on the attached ER diagram, the database already satisfies 3NF. Below is the explanation of how the structure adheres to 3NF:

Below is the table format for each entity in the ER diagram:

Customer Table

Column Name	Data Type	Key
Customer_ID	NUMBER (10)	Primary Key
First_Name	VARCHAR2 (50)	
Last_Name	VARCHAR2 (50)	
Email	VARCHAR2 (100)	
Password	VARCHAR2 (256)	
Phone	VARCHAR2 (15)	
Street_Address	VARCHAR2 (100)	
HouseNumber	VARCHAR2 (10)	
State_Code	CHAR (2)	
ZIP	VARCHAR2 (5)	

Payment_Details Table

Column Name	Data Type	Key
Transaction_ID	NUMBER (10)	Primary Key
Customer_ID	NUMBER (10)	Foreign Key
Date_Time	DATE	
Payment_Method	VARCHAR2 (20)	

Rental Table

Column Name	Data Type	Key
Rental_ID	NUMBER (10)	Primary Key
Start_Dock_ID	NUMBER (10)	Foreign Key
End_Dock_ID	NUMBER (10)	Foreign Key
Start_Date	DATE	
End_Date	DATE	
Rental_Time	Number (10)	
Customer_ID	NUMBER (10)	Foreign Key
Bike_ID	NUMBER (10)	Foreign Key
Transaction_ID	NUMBER (10)	Foreign Key

Bike_Model Table

Column Name	Data Type	Key
Model_ID	NUMBER (10)	Primary Key
Bike_Brand_Name	VARCHAR2 (50)	
Bike_Model_Name	VARCHAR2 (50)	

Bike Table

Column Name	Data Type	Key
Bike_ID	NUMBER (10)	Primary Key
Model_ID	NUMBER (10)	Foreign Key
Dock_ID	NUMBER (10)	Foreign Key
Current_Location	VARCHAR2 (50)	
Rental_Status	CHAR (1)	

Bike_Accessory Table

Column Name	Data Type	Key
Accessory_Item_ID	NUMBER (10)	Foreign Key
Bike_ID	NUMBER (10)	Foreign Key

Accessory Table

Column Name	Data Type	Key
Item_ID	NUMBER (10)	Primary Key

Column Name	Data Type	Key
Item_Name	VARCHAR2 (20)	
Item_Cost	NUMBER (10,2)	

Docks Table

Column Name	Data Type	Key
Dock_ID	NUMBER (10)	Primary Key
Dock_Name	VARCHAR2 (50)	
Dock_Location	VARCHAR2 (50)	
Bike_Capacity	NUMBER (10)	
Bikes_Available	NUMBER (10)	
Employee_ID	NUMBER (10)	Foreign Key

Maintenance Table

Column Name	Data Type	Key
Maintenance_ID	NUMBER (10)	Primary Key
Date_Time	DATE	
Maintenance_Description	VARCHAR2 (500)	
Repair_Cost	NUMBER (10,2)	
Bike_ID	NUMBER (10)	Foreign Key
Employee_ID	NUMBER (10)	Foreign Key

Employee Table

Column Name	Data Type	Key
Employee_ID	NUMBER (10)	Primary Key
First_Name	VARCHAR2 (50)	
Last_Name	VARCHAR2 (50)	
Email	VARCHAR2 (100)	
Phone	VARCHAR2 (15)	
Street_Address	VARCHAR2 (100)	
House_Number	VARCHAR2 (10)	
City	VARCHAR2 (50)	
State_Code	VARCHAR2 (50)	
Zip	VARCHAR2 (5)	
Gender	VARCHAR2 (11)	
Designation	VARCHAR2 (50)	