Database Project Management

Hotel Reservation System

Project Content : ERD , Normalization, Constraints

Project Submission Date : 7 April 2024

Project Team Member

Santosh Acharya

Roshan Bhandari

Balu Rana Magar

Sumit Dulal

Contents

DATABASE TERMINOLOGY

- **Database**

Database is an organized collection of structured data or the information**. Database** help to store and retrieve data in more efficient manner.

- **Entity**

Entity is an object in the database that exists.

- **Attribute**

Attribute refers to a database component, such as a table.

- **Mandatory Attributes**

Mandatory Attributes are the attributes that are required for the table to function and must be contained in the table.

- **Optional Attributes**

Optional Attributes are the attributes that are not essential in the table to function but add some meaning to the table.

- **Cardinality**

Cardinality can be defined as the set of elements arranged in tables and rows.

- **Datatypes**

A data type is an attribute associated with a piece of data that tells a computer system how to interpret its value. Data types mainly classified into three categories for every database.

String Data types

Numeric Data types

Date and time Data types

- **Constraint**

In SQL, a constraint is any rule applied to a column or table that limits what data can be entered into it. Some of Important Constraint are:

- **Primary Key (PK)**

  A primary key is a unique identifier for each record in a database table.

- **Foreign Key (FK)**

  A foreign key is a column or a set of columns in one table that references the primary key columns in another table.

- **NOT NULL**

  NOT NULL is use to specify that a column in a database table must contain a value.

- **Unique Key**

  A unique key is a constraint that ensures the values within a column or group of columns are unique across all rows in a table

- **Candidate Key**

  A candidate key is a set of one or more columns in a database table that can uniquely identify each record (row) within that table.

- **ERD / Entity Relationship Digram**

  A is a visual representation of the entities, their attributes, and the relationships among them within a database or information system.

- **Column Level Constraint**

The Constraint that is implement in the column is known as column level constraint. It is done while creating the table.

- **Table Level Constraint**

The constraint that is implement in the whole table level is known as Table level Constraint. It can be implement into the table. Atler is use for table level constraint.

Entity Table

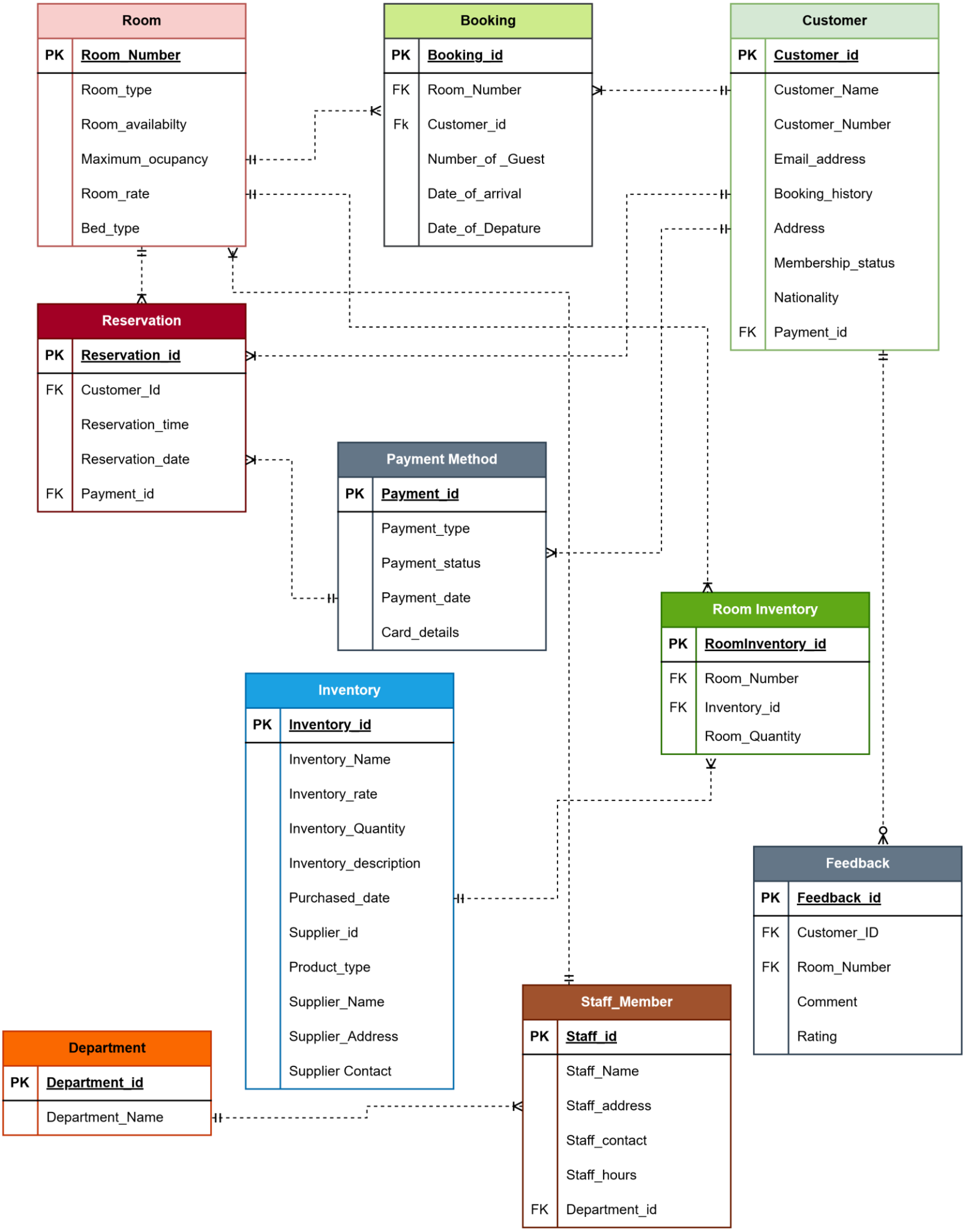
Entities	Required Attributes	Datatype	Optional Attribute	Data Type
Room	**Room_Number (PK)** Room_Type Room_availabilty Maximum_occupancy Room_rate Bed_Type	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50) Varchar(50)		
Booking	**Booking_id (PK)** **Room_Number (FK)** **Customer_id (FK)** Number_of_Guest Date_of_arrival Date_of_Depature	Int Varchar(50) Int Varchar(50) Date Date		
Customer	**Customer_id (PK)** Customer_Name Customer_Number Email_address Address Nationality **Payment_id (FK)**	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50) Int	Booking_history Membership_status	Varchar(10) Varchar(10)
Reservation	**Reservation_id (PK)** **Customer_Id (FK)** Reservation_Time Reservation_date **Payment_id(FK)**	Int Int Varchar(50) Date Int		
Payment Method	**Payment_id (PK)** Payment_type Payment_status	Int Varchar(50) Varchar(50) Date		

	Payment_date Card_details	Varchar(50)		
Room Inventory	**RoomInventory_id (PK)** **Room_Number (FK)** Inventory_id Room_Quantity	Int Varchar(50) Int Varchar(50)		
Supplier	**Supplier_id (PK)** Supplier_Name Supplier_Address Supplier_Contact Product_type	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50)		
Inventory	**Inventory_id (PK)** Inventory_Name Inventory_rate Inventory_Quantity Inventory_description Purchased_date	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50) Date		
Department	**Department_id** (**PK**) Department_Name	Int Varchar(50)		
Staff_Member	**Staff_id (PK)** Staff_Name Staff_address Staff_contact Staff_hours **Department_id (PK)**	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50) Int		
Feedback	**Feedback_id (PK)** **Customer_ID (FK)** **Room_Number (FK)** Rating	Int Int Int Varchar(50)		

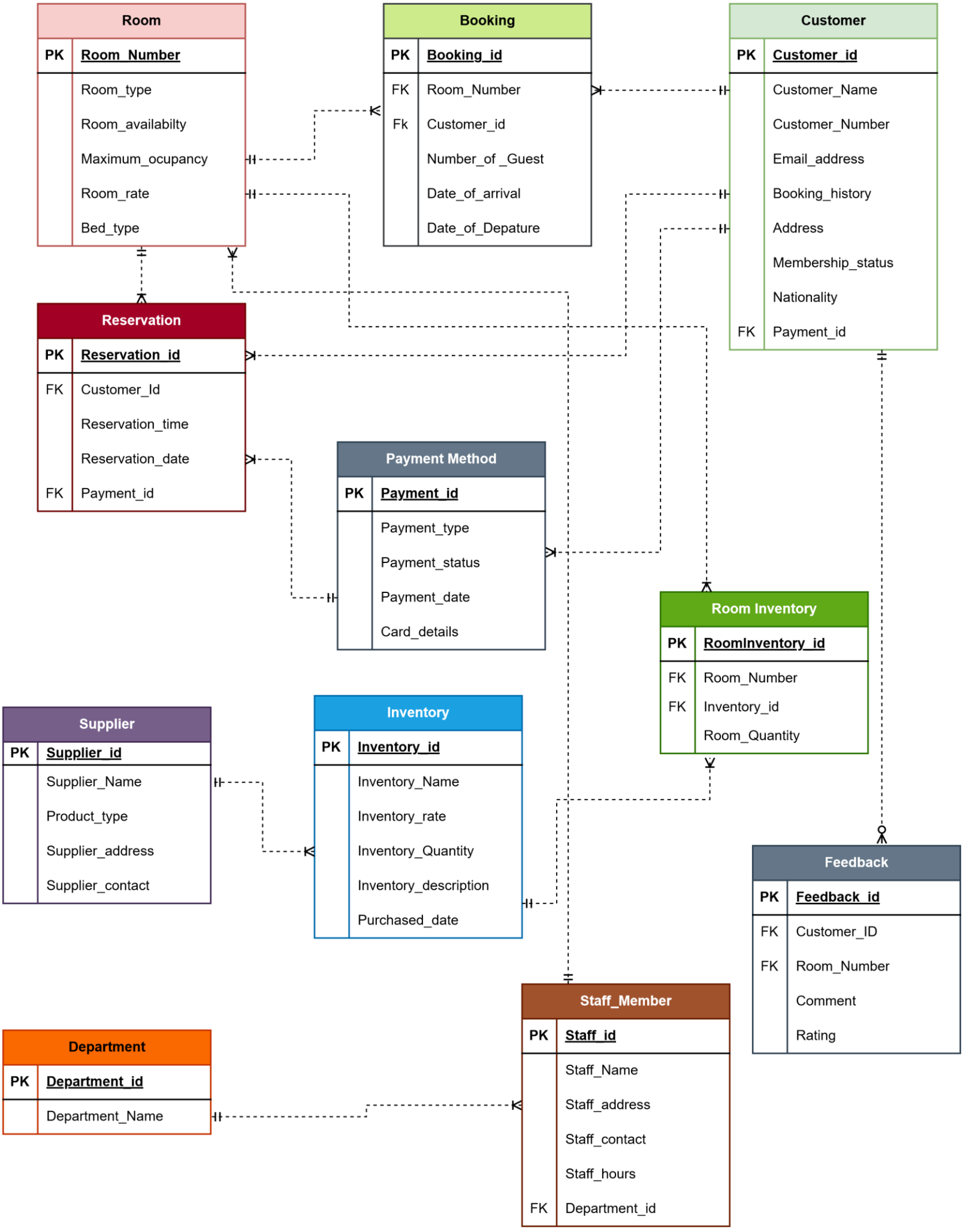
	Comment	Varchar(50)		

Each Room may have one or many booking
Each Room may have one or many room inventory
Each Room may have one or many Reservation
Each Booking have one and only one room
Each Booking have one and only one Customer
Each Customer may have one or many Booking
Each Customer may have one or many payment
Each Customer may have one or many Reservation
Each Customer may have zero, one or many feedback
Each Reservation have one and only one Room
Each Reservation have one and only one payment method
Each Supplier may have one or many Inventory
Each Inventory may have one or many Inventory
Each Staff Member may have one or many room
Each Staff member have one and only one department
Each Department may have one or many staff member
Each feedback have one and only one Customer

ERD BEFORE NORMALIZATION


Room
PK Room_Number
Room_type
Room_availabilty
Maximum_ocupancy
Room_rate
Bed_type
Booking
PK Booking_id
FK Room_Number
Fk Customer_id
Number_of _Guest
Date_of_arrival
Date_of_Depature
Customer
PK Customer_id
Customer_Name
Customer_Number
Email_address
Booking_history
Address
Membership_status
Nationality
FK Payment_id
Reservation
PK Reservation_id
FK Customer_Id
Reservation_time
Reservation_date
FK Payment_id
Payment Method
PK Payment_id
Payment_type
Payment_status
Payment_date
Card_details
Room Inventory
PK RoomInventory_id
FK Room_Number
FK Inventory_id
Room_Quantity
Inventory
PK Inventory_id
Inventory_Name
Inventory_rate
Inventory_Quantity
Inventory_description
Purchased_date
Supplier_id
Product_type
Supplier_Name
Supplier_Address
Supplier Contact
Feedback
PK Feedback_id
FK Customer_ID
FK Room_Number
Comment
Rating
Staff_Member
PK Staff_id
Staff_Name
Staff_address
Staff_contact
Staff_hours
FK Department_id
Department
PK Department_id
Department_Name

ERD AFTER NORMALIZATION


Room
PK Room_Number
Room_type
Room_availabilty
Maximum_ocupancy
Room_rate
Bed_type
Booking
PK Booking_id
FK Room_Number
Fk Customer_id
Number_of _Guest
Date_of_arrival
Date_of_Depature
Customer
PK Customer_id
Customer_Name
Customer_Number
Email_address
Booking_history
Address
Membership_status
Nationality
FK Payment_id
Reservation
PK Reservation_id
FK Customer_Id
Reservation_time
Reservation_date
FK Payment_id
Payment Method
PK Payment_id
Payment_type
Payment_status
Payment_date
Card_details
Room Inventory
PK RoomInventory_id
FK Room_Number
FK Inventory_id
Room_Quantity
Supplier
PK Supplier_id
Supplier_Name
Product_type
Supplier_address
Supplier_contact
Inventory
PK Inventory_id
Inventory_Name
Inventory_rate
Inventory_Quantity
Inventory_description
Purchased_date
Feedback
PK Feedback_id
FK Customer_ID
FK Room_Number
Comment
Rating
Staff_Member
PK Staff_id
Staff_Name
Staff_address
Staff_contact
Staff_hours
FK Department_id
Department
PK Department_id
Department_Name

Normalization

Table With the data

Room

Room_Number	Room_Type	Room_availability	Room_rate	Maximum_occupancy	Bed_type
501	Single Room	Open	155	2	Double bed
502	Double Room	Closed	165	4	King Size
503	Attach room	Closed	250	6	King Size

Booking

Booking_id	**Room_Number**	Customer_Id	Number_of_Guest	Date_of_ arrival	Date_of_Depature
101	502	201	2	2023-12-31	2024-01-02
102	503	205	4	2024-01-23	2024-02-03
103	505	202	5	2024-02-22	2024-02-24

Customer

Customer_id	Customer_Name	Customer_Number	Email_address	Booking_history	Address	membership_status	Nationality	Payment_id
201	Davidson jr	5699513578	david@gmail.com	1	Mississauga	No	US	Card
202	Sam Patel	9876543211	Sampatel2@gmail.com	0	New York	Yes	UK	Cash
205	Hari Krishna	5649872589	Harikrishna02@gmail.com	5	Toronto	Yes	Canadian	Card

Reservation

Reservation_id	**Customer_Id**	Reservation_time	Reservation_date	**Payment_id**
100	252	12:30	2023-12-01	20
101	265	02:00	2024-01-02	25
105	545	13:25	2024-02-25	35

Payment Method

Payment_id	Payment_type	Payment_status	Payment_date	Card_details
25	Card	Full	2024-01-02	RBC
40	Card	Partial	2023-11-25	CIBC
41	None	None	2023-12-24	TD

Room Inventory

RoomInventory_id	Room_Number	Inventory_id	Room_Quantity
1	201	101	20
2	205	103	50
3	203	102	25

Feedback

Feedback_id	Customer_id	Room_number	Comment	Rating
6622	101	252	This is good	5
6988	103	202	Not good service	3
7024	105	208	Very Good Service	5

Department

Department_id	Department_Name
01	Cleaning
02	Kitchen
03	Room Staff

Staff Member

Staff_id	Staff_Name	Staff_address	Staff_contact	Staff_hours	Department_id
20	Ram KC	Mississauga	6578903245	25	03
21	Harry Bonj	Texas	56789032	50	01
23	Roshan Bhandari	Nepal	5896321254	23	02

Inventory

Inventory_id	Inventory_Name	Inventory_rate	Inventory_Quantity	Inventory_description	Purchased_date	Supplier_id	Product_type	Supplier_Name	Supplier_address	Supplier_contact
101	Towel	10	100	For toilet use	2023-12-21	501	Cleaning	Ram Sharma	Mississauga	4379551559

102	Shampo	25	250	For human body	2023-11-20	503	Liquid	David Becham	Toronto	3576545925
103	Chair	35	600	For room	2022-01-12	524	Furnitu re	William Jr	Brampton	5658973654

First Normal Form / 1NF

- 1NF is also known as First Normal Form. It is used to reduce the multivalued and multi-column in the table.

Requirement / Criteria of the 1NF.

- It doesn't contain repeating group and there is no multi-column in the table.
- **Room, Booking, Customer, Reservation, Payment Method, Room Inventory, Feedback, Department and Staff member** are in 1NF. Because, it full fill the 1NF requirement

Inventory was not in 1NF but it also fulfill the criteria to be 1NF

Table Complete the below criteria to be 1NF

- **Inventory_id** and **Supplier_id** are composite key for the table.
- Doesn't contain any multi-valued column or repeating group

Inventory

Inventory_id	**Supplier_id**	Inventory_Name	Inventory_rate	Inventory_Quantity	Inventory_description	Purchased_date	Product_type	Supplier_Name	Supplier_address	Supplier_contact
101	501	Towel	10	100	For toilet use	2023-12-21	Cleaning	Ram Sharma	Mississauga	4379551559
102	503	Shampo	25	250	For human body	2023-11-20	Liquid	David Becham	Toronto	3576545925
103	524	Chair	35	600	For room	2022-01-12	Furnitu re	William Jr	Brampton	5658973654

Second Normal Form / 2NF

The table is said to be in 2NF if it is in 1NF and there is composite key in the 1NF and partial dependency which can be reduce in the 2NF.

Requirement / Criteria to be 2NF

- The table must be in 1NF

- ❖ The 2nd Normal Form is performed when there is composite primary key and partial dependencies.

Room, Booking, Customer, Reservation, Payment Method, Room Inventory, Feedback, Department and Staff member are in 1NF. Because, it full fill the 2NF requirement

Supplier_id is foreign key in inventory

Table Complete the below Criteria to be 2NF

- ❖ Table is already in 1NF
- ❖ There is partial dependency between Inventory_id and Supplier_id which has been eliminated in 2NF

Inventory

Inventory_id	Inventory_name	Inventory_rate	Inventory_quantity	Inventory_Description	Purchase_date	**Supplier_id**
101	Towel	10	100	For toilet Use	2023-12-21	501
102	Shampo	25	250	For human body	2023-11-20	503
103	Chair	35	600	For room	2022-01-12	524

Supplier

Supplier_id	Supplier_name	Supplier_address	Supplier_contact	Product_type
501	Cleaning	Ram Sharma	Mississauga	4379551559
503	Liquid	David Becham	Toronto	3576545925
524	Furniture	William Jr	Brampton	5658973654

Third Normal Form / 3NF

The table should be in 2NF to be in 3NF. There should not be transitive dependency for the table to be in 3NF.

Requirement / Criteria to be 3NF

- ❖ The table must be in 2nd Normal Form to be converted into 3NF ❖ The table should not contain non-key dependencies.

Room, Booking, Customer, Reservation, Payment Method, Room Inventory, Feedback, Department and Staff member are in 2NF. Because, it full fill the 3NF requirement

Table Complete the criteria to be 3NF

- ❖ The table is in 2NF.
- ❖ The table doesn't contain any non-key dependenices.

Inventory

Inventory_id	Inventory_name	Inventory_rate	Inventory_quantity	Inventory_Description	Purchase_date	**Supplier_id**
101	Towel	10	100	For toilet Use	2023-12-21	501
102	Shampo	25	250	For human body	2023-11-20	503
103	Chair	35	600	For room	2022-01-12	524

Supplier

Supplier_id	Supplier_name	Supplier_address	Supplier_contact	Product_type
501	Cleaning	Ram Sharma	Mississauga	4379551559
503	Liquid	David Becham	Toronto	3576545925
524	Furniture	William Jr	Brampton	5658973654

RELATIONAL MATRIX

It is the matrix that show the relation between the entity in the written form. It will provide only the basic information with out giving much context between the table

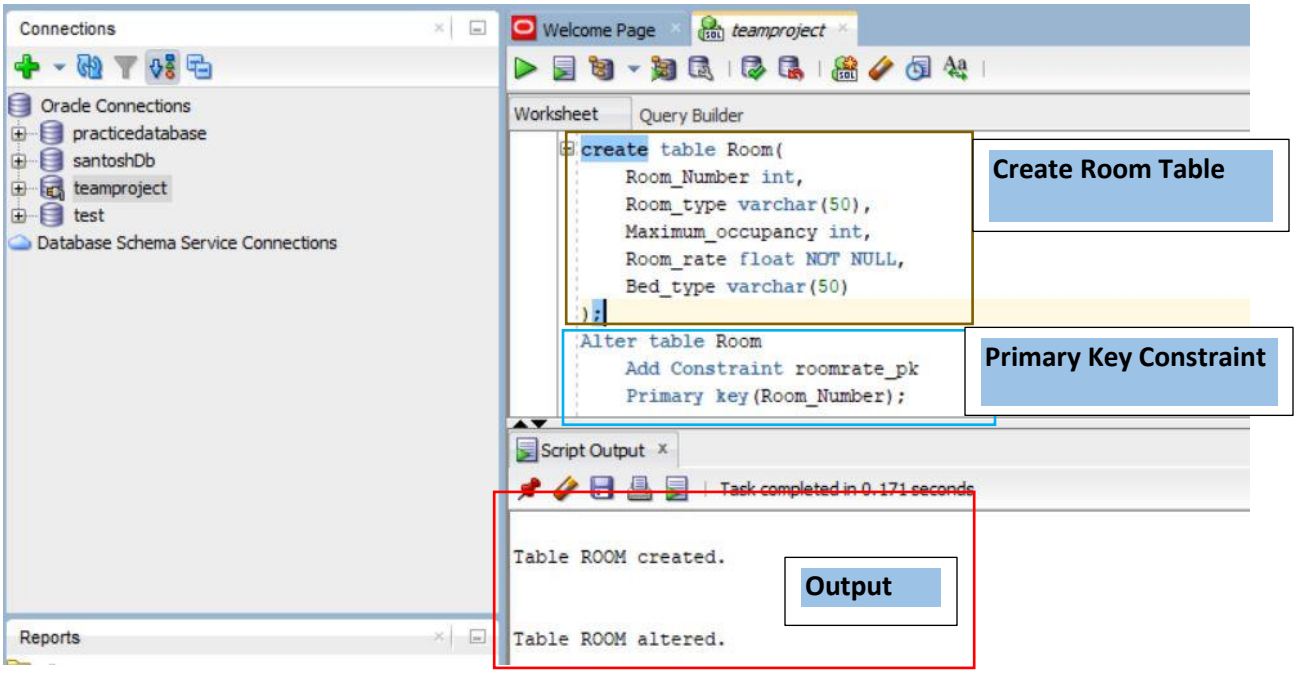
Entities	Room	Booking	Customer	Reservation	Payment Method	Room Inventory	Supplier	Inventory	Department	Staff_Member	Feedback
Room		Booked By		Reserved		**Provided**					
Booking			Has booked		Booked For						
Customer		Has Booked		Has Reserved	Paid To						Given
Reservation											
Payment Method			Paid By								
Room Inventory							Provided				
Supplier								Provided			
Inventory									Has received		
Department											
Staff_Member											
Feedback			Given								

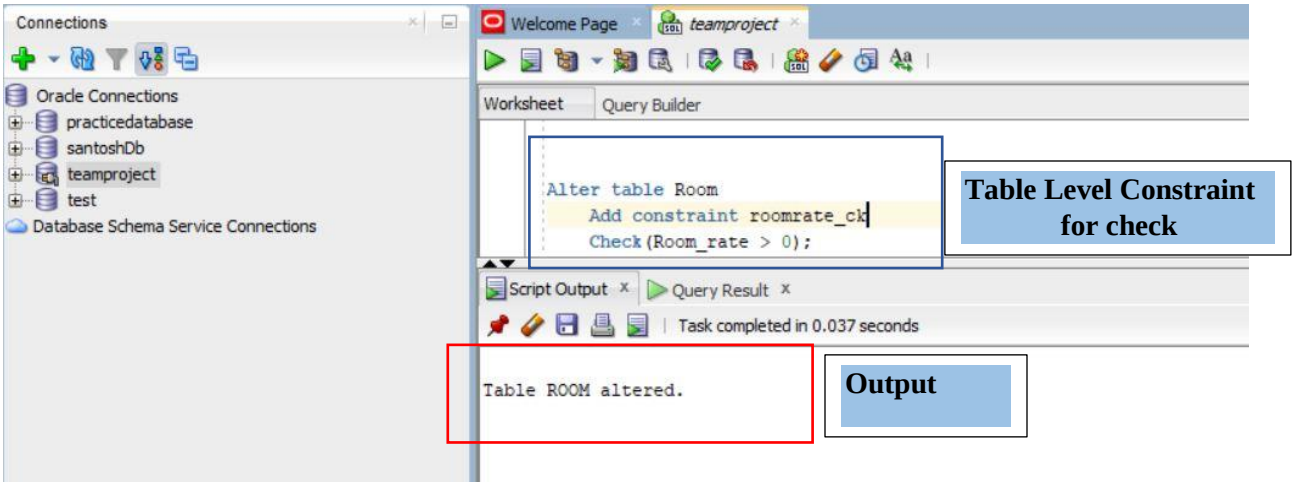
Constraint

Primary Key, Not Null and Check

- Primary key is used to define the unique key in the table it is one of the important constraint of the database.
- Not Null is used in the table when the attributes can't be null in the table.
- Check Constraint is used when the certain condition should be fulfill for the data to be inserted into the table
- The Room used Column level constraint for Not Null and Table level Constraints for Primary Key and Check.
- SQL Query

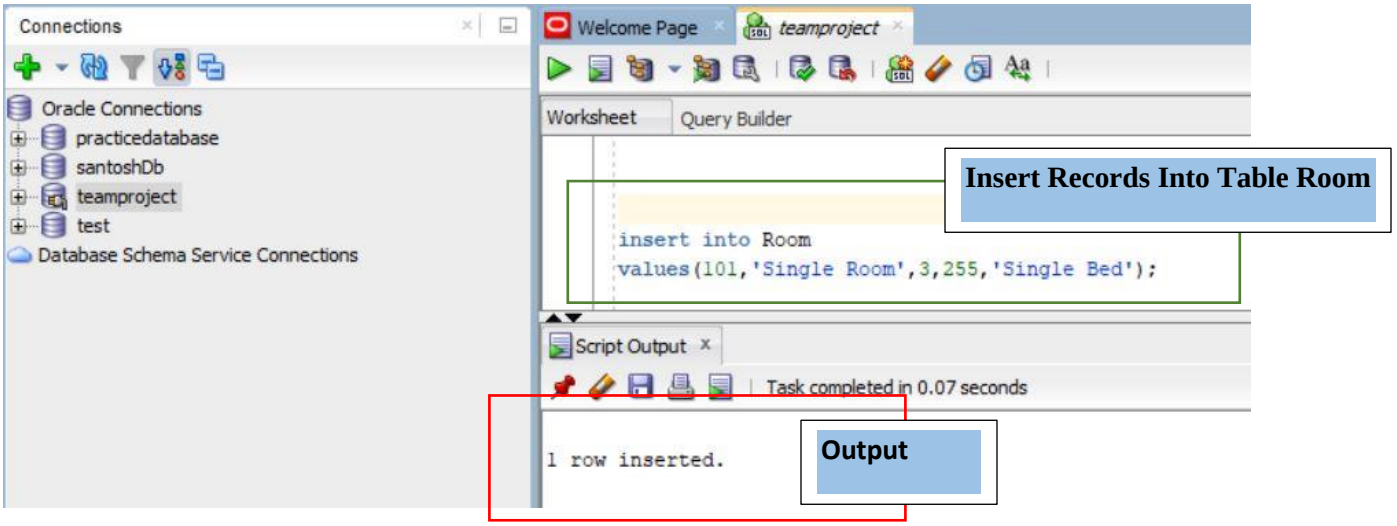
```
create table Room(
        Room_Number int,
        Room_type varchar(50),
        Maximum_occupancy int,
        Room_rate float Not Null,
        Bed_type varchar(50)
);
Alter table Room
        Add Constraint roomrate_pk
        Primary Key(Room_Number)
Alter table Room
        Add Constraint roomrate_ck
        Check(Room_rate > 0);
```



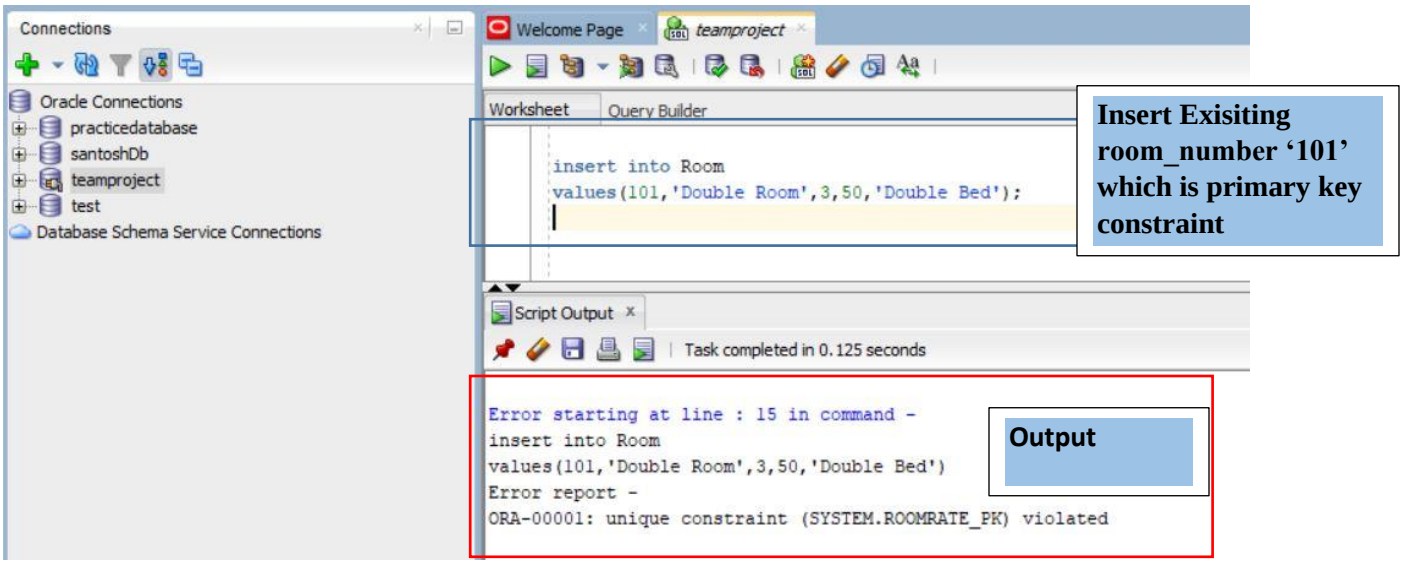


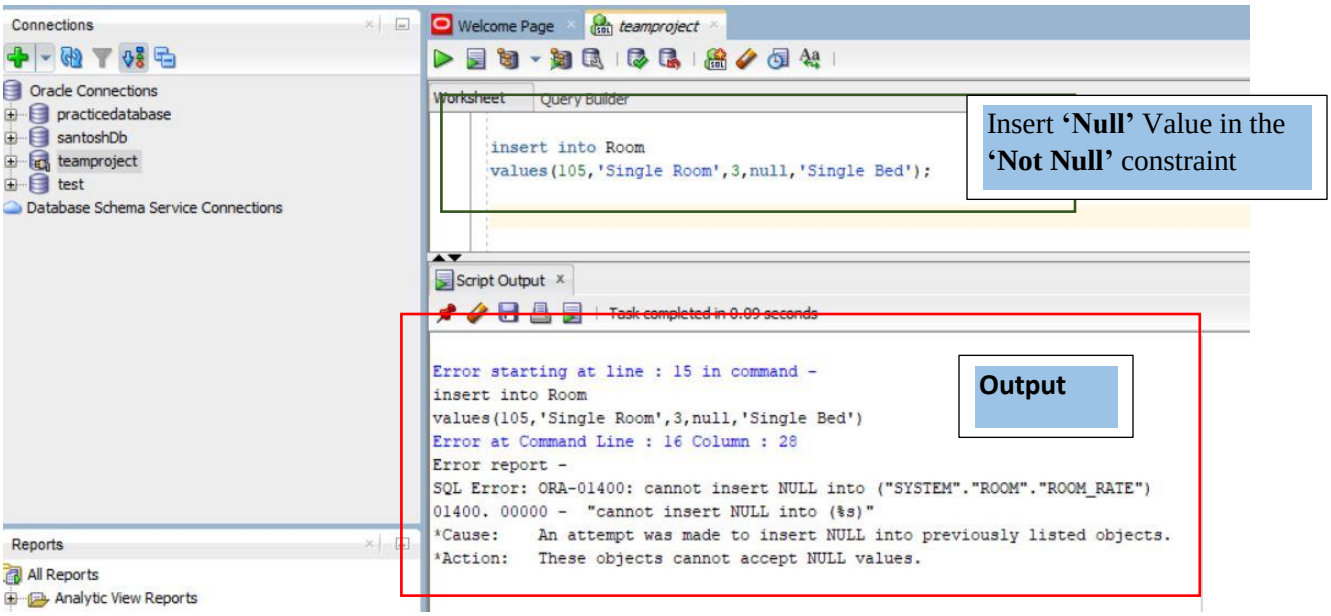
Insert into table

```
Insert into Room
Values(101, 'Single Room',3,255,'Single Bed');
```

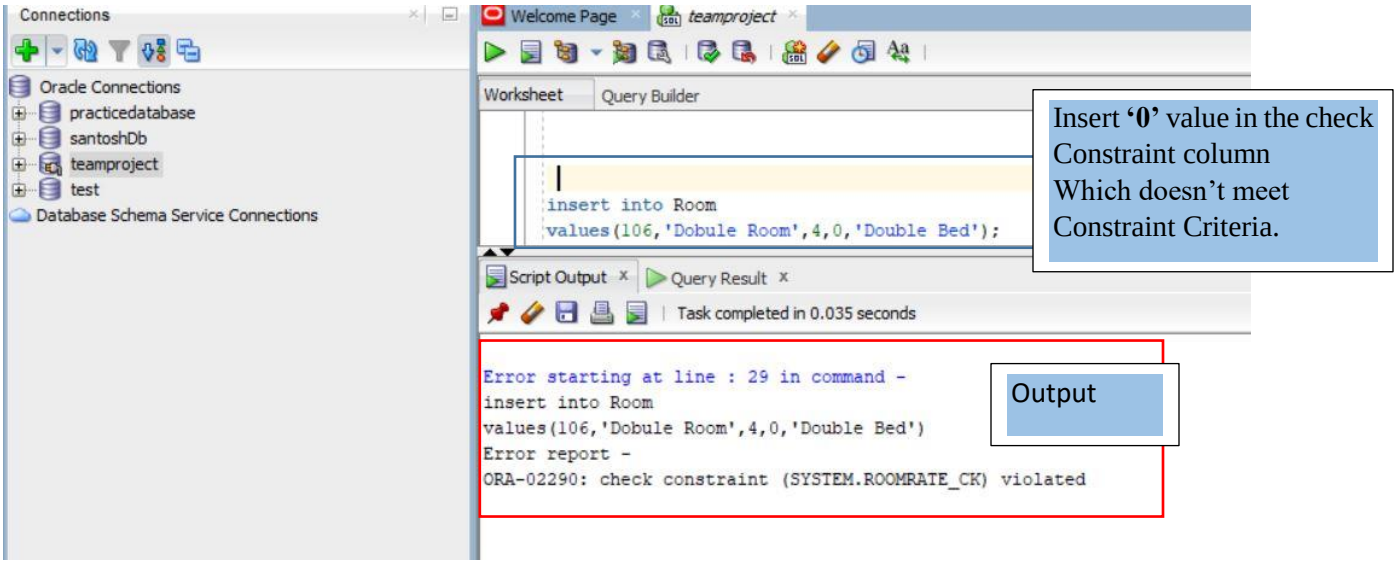


Error in primary key and Not Null

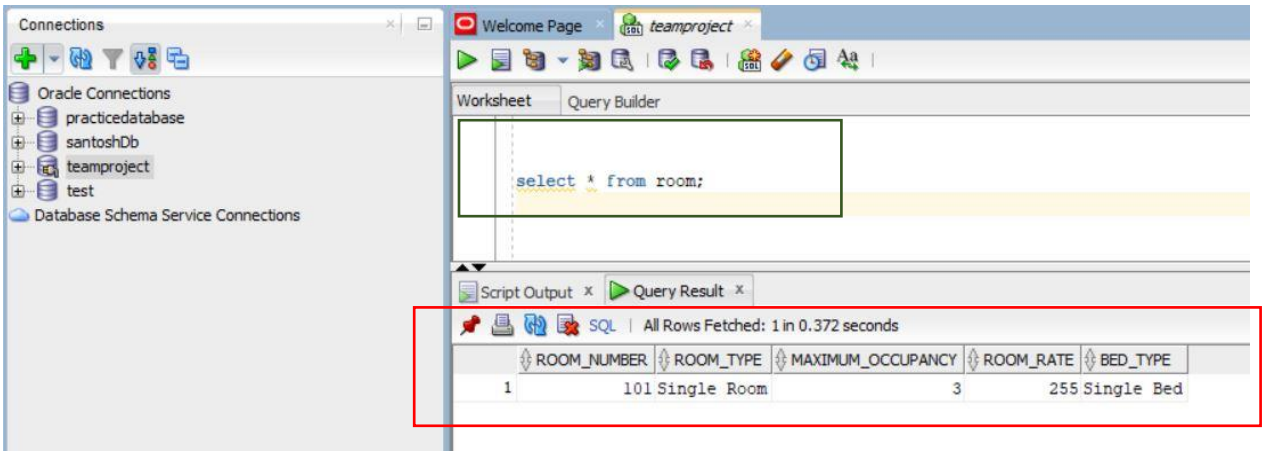




Check Condition error



View of the Room table

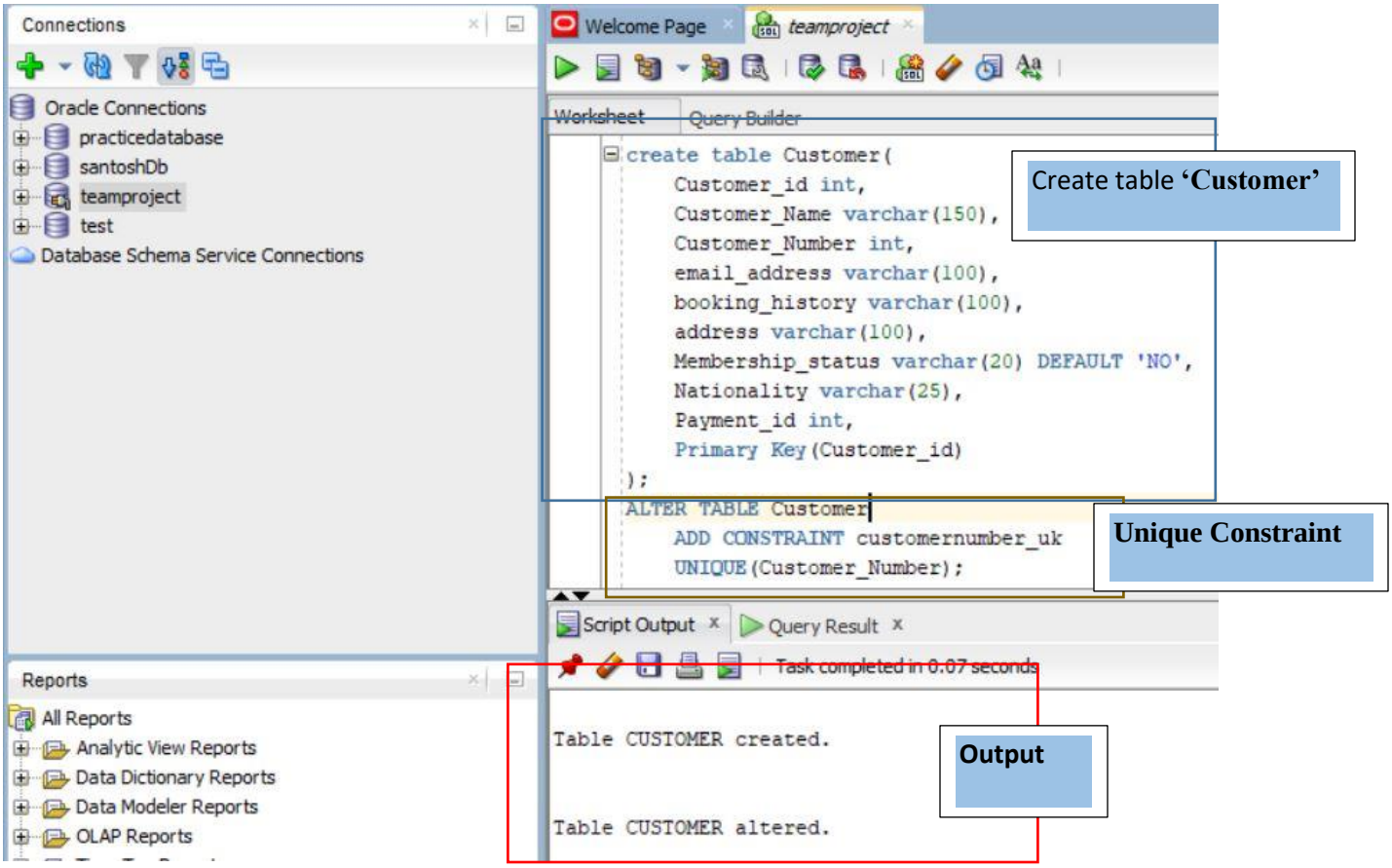


UNIQUE KEY and DEFAULT

- Unique key is used to make the value in the attributes to be unique from each other. It is used when the same value can't be repeated into attributes.
- Default is used to assigned the value to the attributes. If the value is not given to the attributes then it will take the default value.

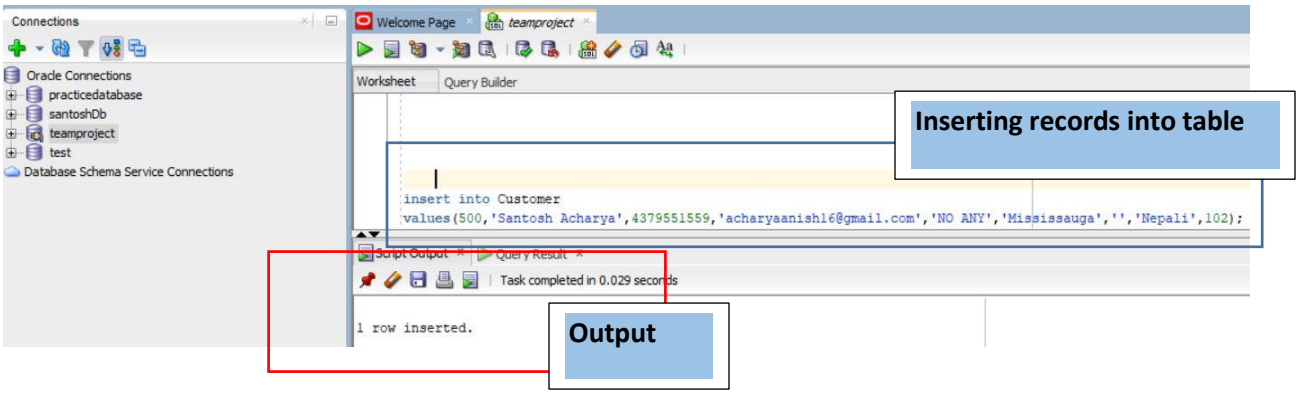
SQL Query

```
create table Customer(
        Customer_id int,
        Customer_Name varchar(150),
        Customer_Number int,
        email_address varchar(100),
        booking_history varchar(100),
        address varchar(100)
        Membership_status varchar(20) DEFAULT 'NO',
        Nationality varchar(25),
        Payment_id int,
        Primary Key(Customer_id)
);
Alter table Customer
        ADD Constraint customernumber_uk
        UNIQUE(Customer_Number);
```

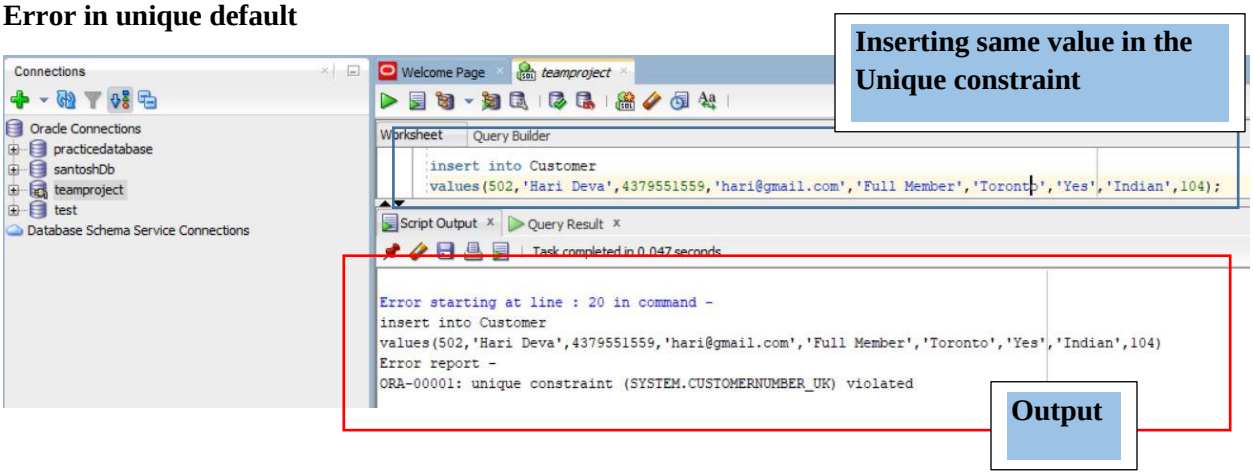


Insert value in Customer table

```
insert into Customer
values(500,'Santosh Acharya',4379551559,'acharyaanish16@gmail.com','No
any','Mississauga','','Nepali',102);
```



Error in unique default



View of the table