

# **Database Project Management**

## **Hotel Reservation System**

**Project Content : ERD , Normalization, Constraints**

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### **Project Team Member**

**Santosh Acharya**

**Roshan Bhandari**

**Balu Rana Magar**

**Sumit Dulal**

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## **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
<b>Room</b>	<b><u>Room Number</u> (PK)</b> Room_Type Room_availability Maximum_occupancy Room_rate Bed_Type	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50) Varchar(50)		
<b>Booking</b>	<b><u>Booking_id</u> (PK)</b> <b>Room_Number (FK)</b> <b>Customer_id (FK)</b> Number_of_Guest Date_of_arrival Date_of_Depature	Int Varchar(50) Int Varchar(50) Date Date		
<b>Customer</b>	<b><u>Customer_id</u> (PK)</b> Customer_Name Customer_Number Email_address Address Nationality <b>Payment_id (FK)</b>	Int Varchar(50) Varchar(50) Varchar(50) Varchar(50) Int	Booking_history Membership_status	Varchar(10) Varchar(10)
<b>Reservation</b>	<b><u>Reservation_id</u> (PK)</b> <b>Customer_Id (FK)</b> Reservation_Time Reservation_date <b>Payment_id(FK)</b>	Int Int Varchar(50) Date Int		
<b>Payment Method</b>	<b>Payment_id (PK)</b> Payment_type Payment_status	Int Varchar(50) Varchar(50) Date		

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

	Comment	Varchar(50)		
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**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	<u>Room_Number</u>
	Room_type
	Room_availability
	Maximum_occupancy
	Room_rate
	Bed_type

Booking	
PK	<u>Booking_id</u>
FK	Room_Number
Fk	Customer_id
	Number_of_Guest
	Date_of_arrival
	Date_of_Depature

Customer	
PK	<u>Customer_id</u>
	Customer_Name
	Customer_Number
	Email_address
	Booking_history
	Address
	Membership_status
	Nationality
FK	Payment_id

Reservation	
PK	<u>Reservation_id</u>
FK	Customer_Id
	Reservation_time
	Reservation_date
FK	Payment_id

Payment Method	
PK	<u>Payment_id</u>
	Payment_type
	Payment_status
	Payment_date
	Card_details

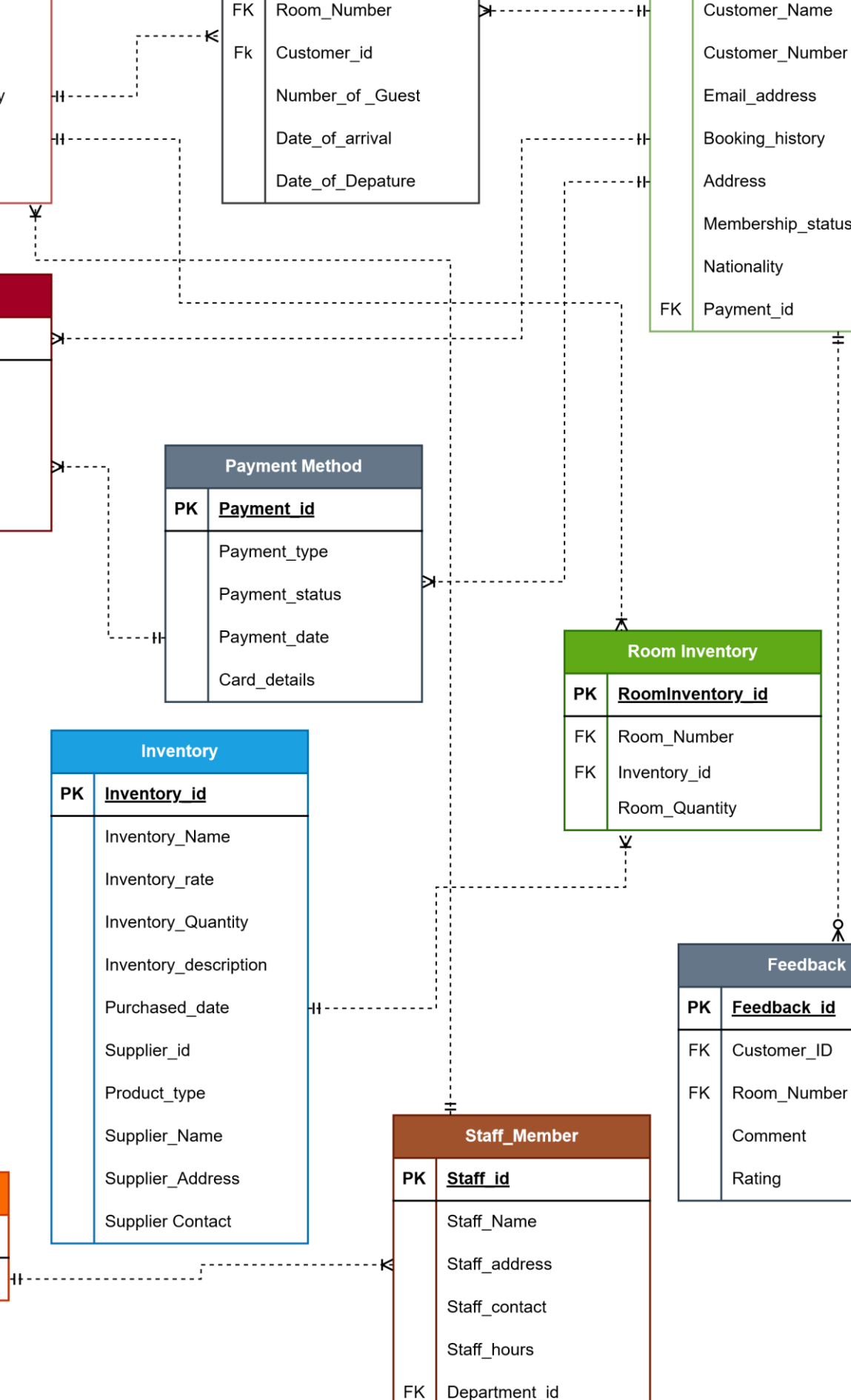
Room Inventory	
PK	<u>RoomInventory_id</u>
FK	Room_Number
FK	Inventory_id
	Room_Quantity

Inventory	
PK	<u>Inventory_id</u>
	Inventory_Name
	Inventory_rate
	Inventory_Quantity
	Inventory_description
	Purchased_date
	Supplier_id
	Product_type
	Supplier_Name
	Supplier_Address
	Supplier Contact

Feedback	
PK	<u>Feedback_id</u>
FK	Customer_ID
FK	Room_Number
	Comment
	Rating

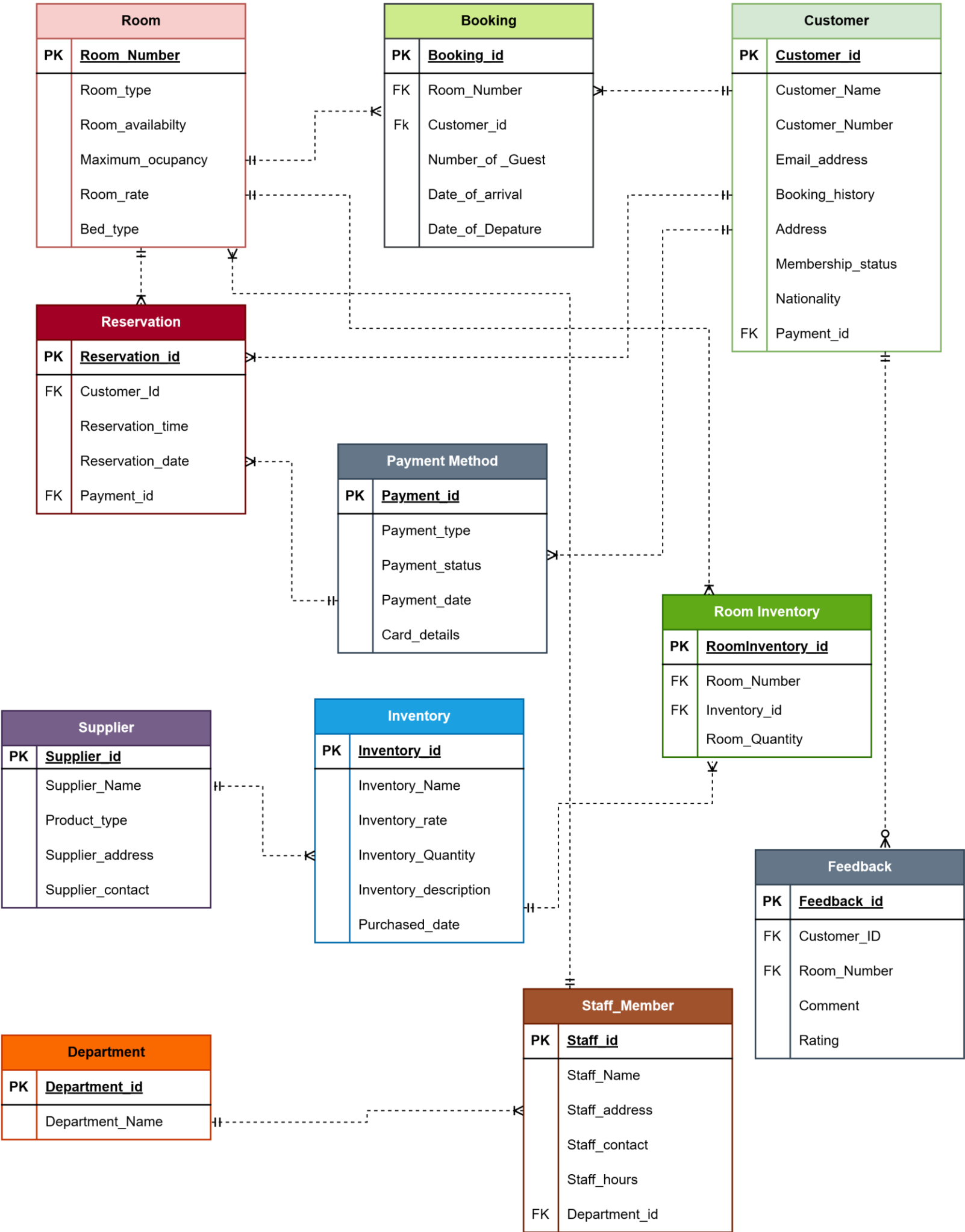
Staff_Member	
PK	<u>Staff_id</u>
	Staff_Name
	Staff_address
	Staff_contact
	Staff_hours
FK	Department_id

Department	
PK	<u>Department_id</u>
	Department_Name





## **ERD AFTER NORMALIZATION**



## 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

Custo mer_id	Custome r_Name	Customer _Number	Email_address	Booking _history	Addre ss	membersh ip_status	Natio nality	Payme nt_id
201	Davidson jr	56995135 78	<a href="mailto:david@gmail.com">david@gmail.com</a>	1	Missis sauga	No	US	Card
202	Sam Patel	98765432 11	<a href="mailto:Sampatel2@gmail.com">Sampatel2@gmail.com</a>	0	New York	Yes	UK	Cash
205	Hari Krishna	56498725 89	Harikrishna02 @gmail.com	5	Toron to	Yes	Can adian	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	Inventor_y_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	Furniture	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	Furniture	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 dependencies.

### 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