

Second Normal Form(2NF)

1. Second Normal Form ensures that the database is in 1NF before applying the rules of Second Normal Form.
2. It eliminates partial dependencies that exist when a non-key attribute depends on only a part of the primary key.
3. It also ensures that all non-key attributes depend on the candidate key.

1. **Entity:** Branch

Branch(Branch_id,Name,Address)

Functional Dependencies:

branch_id \rightarrow name,address

Normal Form:

This is in 2NF (Second Normal Form) with branch_id as primary key
Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

2. **Entity:** customer

customer(customer_id,branch_id,first_name,last_name,date_of_birth,gender)

Functional Dependencies:

Customer_id \rightarrow branch_id,first_name,last_name,date_of_birth,gender

Normal Form:

This is in 2NF (Second Normal Form) with customer_id as primary key
Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

3. **Entity:** customer_loan

customer_loan(customer_id,loan_id)

Functional Dependencies:

customer_id \rightarrow loan_id, loan_id \rightarrow customer_id

Normal Form:

This is in 2NF (Second Normal Form) with customer_id,loan_id as composite primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

4. Entity: account

account(account_id,balance)

Functional Dependencies:

account_id → balance

Normal Form:

This is in 2NF (Second Normal Form) with account_id as primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

5. Entity: account_customer

Account_customer(account_id,customer_id)

Functional Dependencies:

account_id → customer_id, customer_id → account_id

Normal Form:

This is in 2NF (Second Normal Form) with account_id,customer_id as composite primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

6. Entity: loan

loan(loan_id,amount_paid,start_date,end_date)

Functional Dependencies:

loan_id → amount_paid,start_date,end_date

Normal Form:

This is in 2NF (Second Normal Form) with loan_id as primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

7. Entity: loan_account

Loan_account(loan_id,account_id)

Functional Dependencies:

$\text{loan_id} \rightarrow \text{account_id}, \text{account_id} \rightarrow \text{loan_id}$

Normal Form:

This is in 2NF (Second Normal Form) with $\text{loan_id}, \text{account_id}$ as composite primary key. Here, each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

8. **Entity:** loan_type

$\text{loan_type}(\text{loan_type_id}, \text{loan_id}, \text{type}, \text{description}, \text{base_amount}, \text{base_interest_rate})$

Functional Dependencies:

$\text{Loan_type_id}, \text{loan_id} \rightarrow \text{type}, \text{description}, \text{base_amount}, \text{base_interest_rate}$

Normal Form Violation: This violates 2NF

This Entity is divided into 1. loan_type

2. loantype_loan

➤ **Entity:** loan_type

$\text{Loan_type}(\text{loan_type_id}, \text{type}, \text{description}, \text{base_amount}, \text{base_interest_rate})$

Functional Dependencies:

$\text{Loan_type_id} \rightarrow \text{type}, \text{description}, \text{base_amount}, \text{base_interest_rate}$

Normal Form:

This is in 2NF (Second Normal Form) with loan_type_id as primary key. Here, each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

➤ **Entity:** loantype_loan

$\text{loantype_loan}(\text{loan_type_id}, \text{loan_id})$

Functional Dependencies:

$\text{loan_type_id} \rightarrow \text{loan_id}, \text{loan_id} \rightarrow \text{loan_type_id}$

Normal Form:

This is in 2NF (Second Normal Form) with loan_type_id as primary key. Here, each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

9. **Entity:** card

card(card_id,account_id,card_number,expiration_date,is_blocked)

Functional Dependencies:

card_id \rightarrow account_id,card_number,expiration_date,is_blocked

Normal Form:

This is in 2NF (Second Normal Form) with card_id as primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

10. **Entity:** Transaction

Transaction(transaction_id,account_id,description,amount,tdate)

Functional Dependencies:

transaction_id \rightarrow account_id,description,amount,tdate

Normal Form:

This is in 2NF (Second Normal Form) with transaction_id as primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.

11. **Entity:** account_loantype

account_loantype(account_id,loan_type_id)

Functional Dependencies:

account_id \rightarrow loan_type_id, loan_type_id \rightarrow account_id

Normal Form:

This is in 2NF (Second Normal Form) with account_id,loan_type_id as primary key Here,each non-key column in the table is fully dependent on the entire primary key and there are no partial dependencies within the table.