

Third Normal Form(3NF)

1. Third Normal Form takes 2NF further by eliminating transitive dependencies.
2. It ensures that non-key attributes depend only on the primary key and not on other non-key attributes. This helps to avoid data duplication and update anomalies.

1. **Entity:** Branch

Branch(branch_id,Name,Address)

Functional Dependencies:

branch_id \rightarrow name,address

Normal Form:

This is in 3NF (Third Normal Form), with branch_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

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 3NF (Third Normal Form), with customer_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

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 3NF (Third Normal Form), with customer_id,loan_id as composite primary key,Here the table has no eliminated transitive dependencies.Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

4. Entity: account

account(account_id,balance)

Functional Dependencies:

account_id → balance

Normal Form:

This is in 3NF (Third Normal Form), with account_id as primary key,Here the table has no eliminated transitive dependencies.Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

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 3NF (Third Normal Form), with account_id,customer_id as composite primary key,Here the table has no eliminated transitive dependencies.Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

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 3NF (Third Normal Form), with loan_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

7. **Entity:** loan_account

Loan_account(loan_id, account_id)

Functional Dependencies:

loan_id → account_id, account_id → loan_id

Normal Form:

This is in 3NF (Third Normal Form), with customer_id, loan_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

8. **Entity:** loan_type

Loan_type(loan_type_id, type, description, base_amount, base_interest_rate)

Functional Dependencies:

Loan_type_id → type, description, base_amount, base_interest_rate

Normal Form:

This is in 3NF (Third Normal Form), with loan_type_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns..

9. **Entity:** loan_type_loan

loan_type_loan(loan_type_id, loan_id)

Functional Dependencies:

loan_type_id → loan_id, loan_id → loan_type_id

Normal Form:

This is in 3NF (Third Normal Form), with loan_type_id, loan_id as composite primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

10. **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 Violation: This violates 3NF

This Entity is divided into 1.card

2.card_account

➤ **Entity:** card

card(card_id,card_number,expiration_date,is_blocked)

Functional Dependencies:

Card_id \rightarrow card_number,expiration_date,is_blocked

Normal Form:

This is in 3NF (Third Normal Form), with card_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

➤ **Entity:** card_account

Card_account(card_id,account_id)

Functional Dependencies:

Card_id \rightarrow account_id

Normal Form:

This is in 3NF (Third Normal Form), with card_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

11. **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 3NF (Third Normal Form), with transaction_id as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.

12. 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 3NF (Third Normal Form), with account_id, loan_type_id composite as primary key, Here the table has no eliminated transitive dependencies. Each non-key column in the table is only dependent on the primary key, and there are no indirect relationships between non-key columns.