Accounting System

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Lab: Lab 9

Functional dependencies, identify the normal form and normalize the relations if they are not in BCNF form.

1. RealAccount

RealAccount		
FK [Not Null]	AccountID	varchar(20)

Candidate Key:-

{ AccountID }

Functional Dependencies:-

1. AccountID → AccountID

Verify condition of normal forms:-

The table has only one column hence it satisfies BCNF form.

2. NominalAccount

NominalAccount		
FK [Not Null]	AccountID	varchar(20)

Candidate Key:-

{ AccountID }

Functional Dependencies:-

1. AccountID → AccountID

Verify condition of normal forms:-

The table has only one column hence it satisfies BCNF form.

3. PersonalAccount_Email

PersonalAccount_Email		
FK [Not Null]	AccountID	varchar(20)
	EmailAddress	Varchar(100)

Candidate Key:-

{ AccountID, EmailAddress }

Functional Dependencies:-

1. { AccountID, EmailAddress } → { AccountID, EmailAddress }

Verifying Condition of different Normal Forms:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

4. PersonalAccount_Contact

PersonalAccount_ContactNumber		
FK [Not Null]	AccountID	varchar(20)
	ContactNumber	numeric

Candidate Key:-

{ ContactNumber }

Functional Dependencies:-

2. { ContactNumber } → { AccountID }

Verifying Condition of different Normal Forms:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

5. AccountGroup

Account Group		
PK [Not Null]	AccountGroupID	varchar(20)
	Header	boolean
	ShowIn	enum
	Name	Varchar(50)
FK [Not Null]	CompanyID	varchar(20)

Candidate key:-

1. { AccountGroupID }

Functional dependencies:-

1. { AccountGroupID } → { AccountGroupID, Header, ShowIn, Name, CompanyID }

Verify normal form conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

6. Account

Account		
PK [Not Null]	AccountID	varchar(20)
	AccountName	Varchar(50)
	Description	Varchar(300)
FK [Not Null]	AccountGroupID	varchar(20)

Candidate Key:-

{ AccountID }

Function dependencies:-

1. { AccountID } → { AccountID, AccountName, Description, AccountGroupID }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

7. CompanyContactNumber

COMPANY_ContactNumber		
FK [Not Null]	CompanyID	varchar(20)
	ContactNumber	Numeric

❖ **Update Anomalies:-**

As contactNumber can be null we cannot classify it as a candidate key, hence we would have to alter table structure and make ContactNumber NOT NULL, so that it becomes a candidate key and we could form functional dependency.

❖ **After resolving the anomaly:-**

Candidate Key:-

{ ContactNumber }

Function dependencies:-

1. { ContactNumber } → { CompanyID }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

8. Company

COMPANY		
PK [Not Null]	CompanyID	varchar(20)
	CompanyName	Varchar(50)
	GSTIN	Varchar(15)
	AddresLine1	Varchar(300)
	AddresLine2	Varchar(300)
	Pincode	Varchar(6)
FK [Not Null]	CityID	Serial
	Logo	Varchar(50)

Candidate Key:-

{ CompanyID }

Function dependencies:-

1. { CompanyID } → { CompanyID, CompanyName, GSTIN, AddresLine1, AddresLine2, Pincode, CityID, Logo }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

9. Country

Country		
PK [Not Null]	CountryID	Serial
	CountryName	Varchar(30)

Candidate Key:-

{ CountryID }

Function dependencies:-

1. { CountryID } → { CountryID, CountryName }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

10. State

State		
PK [Not Null]	StateID	Serial
	StateName	Varchar(30)
FK [Not Null]	CountryId	Serial

Candidate Key:-

{ StateID }

Function dependencies:-

1. { StateID } → { CountryID, StateID, StateName }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

11. FinancialTransactions

FinancialTransactions		
PK (Not Null)	TransactionNumber	INT
	Description	Varchar(300)
	TransactionDate	Date

Candidate Key:-

{ TransactionNumber }

Function dependencies:-

1. { TransactionNumber } →
   { TransactionNumber, Description, TransactionDate }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

12. FinancialTransactionsEntry

FinancialTransactionsEntry		
FK (Not Null)	AccountID	INT
FK (Not Null)	TransactionNumber	INT
	Amount	Decimal

Candidate Key:-

{ AccountID, TransactionNumber }

Functional Dependencies:-

1. { AccountID, TransactionNumber } → { AccountID, TransactionNumber, Amount}

Verifying Condition of different Normal Forms:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

13. PurchaseInvoice

PurchaseInvoice		
PK [Not Null]	ReceiptID	INT
	Date	DATE
FK (Not Null)	AccountID	varchar(20)
FK, PK (Not Null)	CompanyID	varchar(20)

Candidate Key:-

1. { ReceiptID }
2. { ReceiptID, CompanyID} (selected in design)

Function dependencies:-

1. { ReceiptID } → { ReceiptID, Date, AccountID, CompanyID }
2. { ReceiptID , CompanyID} → { ReceiptID, Date, AccountID, CompanyID }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

14. PurchaseItem

Purchase Item		
FK (Not Null)	ReceiptID	SERIAL
FK (Not Null)	ItemID	varchar(20)
	Amount	decimal(15,2)
	Qty	real

Candidate Key:-

{ ReceiptID, ItemID }

Function dependencies:-

1. { ReceiptID , ItemID } → { ReceiptID, ItemID, Amount, Qty }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

15. SalesInvoice

SalesInvoice		
PK [Not Null]	InvoiceID	INT
	Date	DATE
FK (Not Null)	AccountID	varchar(20)
FK, PK (Not Null)	CompanyID	varchar(20)

Candidate Key:-

1. { InvoiceID}
2. { InvoiceID, CompanyID} (selected in design)

Function dependencies:-

1. { InvoiceID } → { InvoiceID, Date, AccountID, CompanyID }
2. { InvoiceID, CompanyID} → { InvoiceID, Date, AccountID, CompanyID }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

16. SalesItem

Sales Item		
FK (Not Null)	InvoiceID	SERIAL
FK (Not Null)	ItemID	varchar(20)
(Not Null)	Amount	decimal(15,2)
(Not Null)	Qty	real

Candidate Key:-

{ InvoiceID, ItemID }

Function dependencies:-

1. { InvoiceID , ItemID } → { InvoiceID, ItemID, Amount, Qty }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

17. ItemGroup

ItemGroup		
PK [Not Null]	ItemGroupID	varchar
	Category	Varchar
FK [Not Null]	CompanyID	varchar
FK	ParentItemGroupID	varchar

Candidate Key:-

{ItemGroupID}

Function dependencies:-

1. {ItemGroupID} → {ItemGroupID, Category, CompanyID, ParentItemGroupID }

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

18. Item

Item		
PK [Not Null]	ItemID	varchar
	ItemName	Varchar
	Barcode	INT
	Price	Numeric
FK [Not Null]	ItemGroupID	varchar

Candidate Key:-

{ ItemID }

Function dependencies:-

1. { ItemID } → { ItemID, ItemName, Barcode, Price, ItemGroupID}

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

19. City

City		
PK [Not Null]	CityID	Serial
	CityName	Varchar
FK [Not Null]	StateID	Serial

Candidate Key:-

{ CityID }

Function dependencies:-

1. { CityID } → { CityID, CityName, StateID}

Verify normal forms conditions:-

1. The table has no multivalued attribute hence it satisfies 1 NF condition.
2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.

20. PersonalAccount

PersonalAccount		
FK [Not Null]	AccountID	varchar(20)
	CompanyName	Varchar(50)
	GSTIN	Varchar(15)
	AddresLine1	Varchar(300)
	AddresLine2	Varchar(300)
	Pincode	Varchar(6)

- **Update, Delete Anomalies:-**

  As accountID must be unique we cannot classify it as a candidate key, hence we would have to alter table structure and make ContactNumber UNIQUE, so that it becomes a candidate key and we could form functional dependency.

- **After resolving the anomaly:-**

  Candidate Key:-

  { AccountID }

  Functional dependencies:-

  1. { AccountID } → { AccountID, CompanyName, GSTIN, AddressLine1, AddressLine2, Pincode }

  Verify normal forms conditions:-

  1. The table has no multivalued attribute hence it satisfies 1 NF condition.
  2. The LHS of the above functional dependencies, it is a candidate key. Hence it satisfies 2nd NF condition.
  3. The LHS of the above functional dependencies, it is a super key. Hence it satisfies 3rd NF condition.
  4. The LHS of the above functional dependencies, it is a super key. Hence it satisfies the BCNF condition.