Database Normalization: Customer Orders Table

Unnormalized Form (UNF)

The given table is not normalized as it contains multi-valued attributes in the ItemsPurchased column.

OrderID	CustomerName	CustomerPhone	ItemsPurchased	TotalAmount
1	John Doe	555-1234	"Laptop - $1000, Mouse - $20"	$1020
2	Jane Smith	555-5678	"Keyboard - $50, Monitor - $300"	$350
3	John Doe	555-1234	"Headphones - $80"	$80

First Normal Form (1NF)

Issue: ItemsPurchased contains multiple values in one cell.
Solution: Convert multi-valued attributes into separate rows.

Orders Table (1NF)

OrderID	CustomerID	TotalAmount
1	1	$1020
2	2	$350
3	1	$80

Customers Table (1NF)

CustomerID	CustomerName	CustomerPhone
1	John Doe	555-1234
2	Jane Smith	555-5678

OrderItems Table (1NF)

OrderID	ItemName	Price
1	Laptop	$1000
1	Mouse	$20
2	Keyboard	$50
2	Monitor	$300
3	Headphones	$80

Second Normal Form (2NF)

Issue: Partial dependency in OrderItems (Item details depend on ItemName instead of OrderID).

Solution: Move ItemName and Price to a separate Items table.

Items Table (2NF)

ItemID	ItemName	Price
1	Laptop	$1000
2	Mouse	$20
3	Keyboard	$50
4	Monitor	$300
5	Headphones	$80

OrderItems Table (2NF)

OrderID	ItemID
1	1
1	2
2	3

OrderID	ItemID
2	4
3	5

Third Normal Form (3NF)

The tables are already in 3NF after 2NF, as all attributes depend only on their respective primary keys.

Final Normalized Schema (3NF)

1. **Customers Table** (CustomerID is primary key)
2. **Orders Table** (OrderID is primary key, references CustomerID)
3. **Items Table** (ItemID is primary key)
4. **OrderItems Table** (Composite primary key: OrderID, ItemID)

The database is fully normalized to 3NF.