Q1.

This is the given table

EmployeeID EmployeeName Department ManagerID Salary HireDate

1 John Smith HR 101 50000 2022-01-15

2 Alice Brown IT 102 60000 2022-02-20

3 Mark Johnson Sales 101 550 00 2022-03-10

Here, we can observe a deletion anomaly: if an employee is deleted from this table, the data related to department and manager would also be deleted. To avoid this anomaly, we split it into three tables as given below.

Employee Table

EmployeeID EmployeeName Salary HireDate

1 John Smith 50000 2022-01-15

2 Alice Brown 60000 2022-02-20

3 Mark Johnson 55000 2022-03-10

Department table

Department DepartmentID

HR D1

IT D2

Sales D3

Manager Table

ManagerId

101

102

EmployeeDepartmentManagerMapping table

EmployeeID DepartmentID ManagerID

1 D1 101

2 D2 102

3 D3 101

So now the tables are in 3nf.

Q2.Training programs

ProgramID ProgramName Trainer Department EmployeeID EmployeeName Date

1 Java Fundamentals John Smith IT 101 Alice Brown 2022-03-01

2 Project Management Sarah White HR 102 Bob Green 2022-03-10

3 Sales Techniques Mark Johnson Sales 103 Charlie Black 2022-03-20

It is already in 1nf.

Remove partial dependency-

EmployeeName depends solely on EmployeeID and not on the entire primary key ProgramID, indicating a partial dependency. To resolve this, separate the information about employees into another table, using EmployeeID as the primary key.

Program table

ProgramID ProgramName Trainer

1 Java Fundamentals John Smith

2 Project Management Sarah White

3 Sales Techniques Mark Johnson

ProgramEmployeeMapping

ProgramID Department EmployeeID EmployeeName Date

1 IT 101 Alice Brown 2022-03-01

2 HR 102 Bob Green 2022-03-10

3 Sales 103 Charlie Black 2022-03-20

Removing transitive dependency- The transitive dependency where EmployeeID depends on ProgramID, and ProgramID depends on ProgramName suggests the need to create a separate program table to resolve this issue.

Employee table

EmployeeID EmployeeName

101 Alice Brown

102 Bob Green

103 Charlie Black

Program table

ProgramID ProgramName Trainer

1 Java Fundamentals John Smith

2 Project Management Sarah White

3 Sales Techniques Mark Johnson

ProgramEmployeeMapping

ProgramID Department EmployeeID Date

1 IT 101 2022-03-01

2 HR 102 2022-03-10

3 Sales 103 2022-03-20

To avoid deletion anomaly

Employee table

EmployeeID EmployeeName

101 Alice Brown

102 Bob Green

103 Charlie Black

Program table

ProgramID ProgramName Trainer

1 Java Fundamentals John Smith

2 Project Management Sarah White

3 Sales Techniques Mark Johnson

Department table

DepartmentID Department

1 IT

2 HR

3 Sales

ProgramEmployeeMapping

ProgramID DepartmentID EmployeeID Date

1 D1 101 2022-03-01

2 D2 102 2022-03-10

3 D3 103 2022-03-20

Q3.

Customer orders

OrderID CustomerName ProductID ProductName Qty UnitPrice TotalAmount OrderDate

1 John Doe 101 Laptop 2 800 1600 2022-01-15

2 Jane Smith 102 Smartphone 1 500 500 2022-02-20

3 John Doe 103 Printer 1 200 200 2022-03-10

To make it 2NF divide customerOrders into customer\_details, product\_details and customer\_order tables

customer\_details

CustomerID CustomerName

C1 John Doe

C2 Jane Smith

product\_details

ProductID ProductName UnitPrice

101 Laptop 800

102 Smartphone 500

103 Printer 200

customer\_order

OrderID CustomerId ProductID Qty TotalAmount OrderDate

1 C1 101 2 1600 2022-01-15

2 C2 102 1 500 2022-02-20

3 C1 103 1 200 2022-03-10

Q4.

Stress management

EmployeeID FirstName LastName StressLevel HoursOfWork BreaksTaken PhysicalActivity CounselingSessions

101 Sarah White Moderate 45 3 Yoga 2

102 Bob Green High 50 2 Jogging 1

103 Charlie Black Low 40 4 Meditation 3

104 David Miller High 48 1 Gym 2

105 Jane Doe Moderate 42 3 Walking 1

Already in 1NF

separate the employee details into a table to make it 2NF

employee\_details

EmployeeID FirstName LastName HoursOfWork BreaksTaken

101 Sarah White 45 3

102 Bob Green 50 2

103 Charlie Black 40 4

104 David Miller 48 1

105 Jane Doe 42 3

employee\_stress\_management

EmployeeID StressLevel PhysicalActivity CounselingSessions

101 Moderate Yoga 2

102 High Jogging 1

103 Low Meditation 3

104 High Gym 2

105 Moderate Walking 1

Q5.

Given table:-

Flee Market

ItemID SellerName ItemName Category Price Quantity Description Condition Location DateListed

101 John's Treasures Vintage Chair Furniture 50.00 2 Beautiful vintage chair, excellent condition Like New Booth 15, Section A 2022-01-15

102 Alice's Finds Antique Clock Home Decor 80.00 1 Authentic antique clock with Roman numerals Good Stall 8, Section B 2022-02-20

103 Mark's Collectibles Vinyl Records Music 15.00 10 Various artists and genres, in good condition Used Booth 20, Section C 2022-03-10

104 Emma's Treasures Vintage Jewelry Accessories 35.00 5 Assorted vintage jewelry pieces, unique designs Excellent Stall 12, Section D 2022-04-05

105 Robert's Finds Retro Camera Electronics 60.00 1 Vintage Polaroid camera with original case Good Booth 5, Section A 2022-05-15

To eliminate the deletion anomaly, it is necessary to create three separate tables: category, item, and seller. Finally, a ItemSellerMapping mapping table is established. Through this approach, it can be observed that the resulting tables have no partial dependency, ensuring compliance with the Second Normal Form (2NF). Furthermore, there is no transitive dependency, demonstrating the attainment of the Third Normal Form (3NF).

Category table

Here CategoryId is the primary key

CategoryId Category

C1 Furniture

C2 Home Decor

C3 Music

C4 Accessories

C5 Electronics

Item table

Here ItemID is the primary key

ItemID ItemName CategoryId Price Quantity Description Condition DateListed

101 Vintage Chair C1 50.00 2 Beautiful vintage chair, excellent condition Like New 2022-01-15

102 Antique Clock C2 80.00 1 Authentic antique clock with Roman numerals Good 2022-02-20

103 Vinyl Records C3 15.00 10 Various artists and genres, in good condition Used 2022-03-10

104 Vintage Jewelry C4 35.00 5 Assorted vintage jewelry pieces, unique designs Excellent 2022-04-05

105 Retro Camera C5 60.00 1 Vintage Polaroid camera with original case Good 2022-05-15

Seller table

Here SellerID is the primary key

SellerID SellerName Location

S1 John's Treasures Booth 15, Section A

S2 Alice's Finds Stall 8, Section B

S3 Mark's Collectibles Booth 20, Section C

S4 Emma's Treasures Stall 12, Section D

S5 Robert's Finds Booth 5, Section A

ItemSellerMapping table

ItemID SellerId

101 S1

102 S2

103 S3

104 S4

105 S5

Q6.Learning Management System

CID CourseName Instructor Department Credits Enrolled

Students StartDate EndDate Location Availability

101 Introduction to Biology Prof. Smith Science 3 25 2022-01-15 2022-05-10 Room 101 Open

102 Programming in Python Prof. Brown Computer Science 4 30 2022-02-20 2022-06-15 Lab 3, Building B Closed

103 Financial Accounting Prof. Green Finance 3 20 2022-03-10 2022-07-05 Room 201 Open

104 English Literature Prof. White Humanities 3 22 2022-04-05 2022-08-20 Room 301 Open

105 Web Development Fundamentals Prof. Black IT 4 28 2022-05-15 2022-09-25 Lab 2, Building A Closed

Table is in 1NF.

Since there is no partial dependency it is in 2NF.

course\_details

CID CourseName Department Credits Availability

101 Introduction to Biology Science 3 Open

102 Programming in Python Computer Science 4 Closed

103 Financial Accounting Finance 3 Open

104 English Literature Humanities 3 Open

105 Web Development Fundamentals IT 4 Closed

instructor\_details

InstructorID Instructor

I1 Prof. Smith

I2 Prof. Brown

I3 Prof. Green

I4 Prof. White

I5 Prof. Black

learning\_management

CID InstructorID Enrolled Students StartDate EndDate Location Location\_Lab

101 I1 25 2022-01-15 2022-05-10 Room 101 null

102 I2 30 2022-02-20 2022-06-15 Building B Lab 3

103 I3 20 2022-03-10 2022-07-05 Room 201 null

104 I4 22 2022-04-05 2022-08-20 Room 301 null

105 I5 28 2022-05-15 2022-09-25 Building A Lab 2