1. Employee

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	55000	2022-03-10

The given table is in 3NF as there are no transitive dependency

Optimized relation are:

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

Employee

DeptID	DeptName
D1	HR
D2	IT
D3	Sales

Department

EmpID	DeptID	ManagerID
1	D1	101
2	D2	102
3	D3	101

Emp_Dept_Manager_Mapping

****

2. Training Programs

ProgramID	ProgramName	Trainer	Department	Employee ID	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

(ProgramID, EmployeeID) is the candidate key here.

The given table is not in 2NF as there are partial dependency.(ProgramID -> ProgramName, ProgramID-> Trainer, PogramID -> Dept, ProgramID -> Date, EmployeeID -> EmployeeName.etc...)

The 2NF of the relation is;

ProgramID	ProgramName	Trainer	Date
1	Java Fundamentals	John Smith	2022-01-15
2	Project Management	Sarah White	2022-02-20
3	Sales Techniques	Mark Johnson	2022-03-10

Program

DeptID	DeptName
D1	IT
D2	HR
D3	Sales

Dept

EmpID	EmpName
101	Alice Brown
102	Bob Green
103	Charlie Black

Employee

ProgramID	EmpID	DeptID
1	101	D1
2	102	D2

3	103	D3

Program_Employee_Dept_Mapping

Now the relation is in 3NF as well.

****

3. Customer orders

OrderID	Customer Name	ProductID	Product Name	Qty	Unit Price	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

Candidate Key = (OrderID, ProductID)

Partial Depenedencies = (OrderID -> CustomerName, OrderID -> TotalAmount, OrderID -> OrderDate, ProductID -> ProductName, ProductID -> UnitPrice)

The given relation is not in 2NF

2NF of the relation are;

OrderID	CustomerName	TotalAmount	OrderDate
1	John Doe	1600	2022-01-15
2	Jane Smith	500	2022-02-20
3	John joe	200	2022-03-10

Order

ProductID	ProductName	UnitPrice
101	Laptop	800
102	Smartphone	500
103	Printer	200

Products

OrderID	ProductID	Quantity
1	101	2
2	102	1
3	103	1

Order_Products_Mapping

The relations are now in 3NF as well.

****

4. Stress management

EmployeeID	FirstName	LastName	StressLevel	HoursofWork	BreaksTaken	PhysicalActivity	CounsellingSessions
101	Sarah	White	Moderate	45	3	Yogga	2
102	Bob	Green	High	50	2	Jogging	1
103	Charlie	Black	Low	40	4	Meditation	3
104	David	Miler	High	48	1	Gym	2
105	Jane	Doe	Moderate	42	3	Walking	1

The given table is in 2NF as there are no partial dependency

The 3NF of the relation are;

EmployeeID	FirstName	LastName	HoursofWork	BreaksTaken
101	Sarah	White	45	3
102	Bob	Green	50	2
103	Charile	Black	40	4
104	David	Miler	48	1
105	Jane	Doe	42	3

Employee

StressLevelID	StressLevel
S1	Low
S2	Moderate
S3	High

Stress

ActivityID	PhysicalActivity
PA1	Yoga
PA2	Jogging
PA3	Meditation
PA4	Gym
PA5	Walking

Acvity

EmployeeID	StressLevelID	ActivityID	CounsellingSessions
101	S2	PA1	2
102	S3	PA2	1
103	S1	PA3	3
104	S3	PA4	2
105	S2	PA5	1

Employee_Stress_Activity_Mapping

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5. 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 Find’s	Antique Clock	Home Decor	80.00	1	Authentic antique clock with Roman numerals	Good	Stall 8, Section B	2022-02-20
103	Marks 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 Treasure’s	Vintage Jewellery	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

Candidate Key = (ItemID)

There are no partial dependencies so the relation is in 2NF

Transitive Dependencies = (SellerName -> Location)

The 3NF relations are;

ItemID	ItemName	Category	Price	Qty	Description	Condition
101	Vintage Chair	Furniture	50.00	2	Beautiful vintage chair, excellent	Like New

					condition	
102	Antique Clock	Home Decor	80.00	1	Authentic antique clock with Roman Numerals.	Good
103	Vinyl Records	Music	15.00	10	Various artists and genres, in good condition.	Used
104	Vintage Jewellery	Accessories	35.00	5	Assorted vintage jewelry pieces, unique designs.	Excellent
105	Retro Camera	Electronics	60.00	1	Vintage Polaroid camera with original case.	Good

Item

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 Fids	Booth 5, Section A

Seller

SellerID	ItemID	DateListed
S1	101	2022-01-15
S2	102	2022-02-20
S3	103	2022-03-10
S4	104	2022-04-05
S5	105	2022-05-15

Item_Seller_Mapping

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6. Learning Management System

CID	Course Name	Instructor	Department	Credits	EnrolledStudents	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

The given relation is in 2NF

3NF relations are;

CID	CourseName	Credits	Availability
101	Introduction to Biology	3	Open
102	Programming in Python	4	Closed
103	Financial Accounting	3	Open
104	English Literature	3	Open
105	Web Development Fundamentals	4	Closed

Course

DeptID	DeptName
D1	Science
D2	Computer Science
D3	Finance
D4	Humanities
D5	IT

Departments

InstructorID	InstructorName	DeptID
1	Prof. Smith	D1
2	Prof. Brown	D2
3	Prof. Green	D3
4	Prof. White	D4
5	Prof. Black	D5

Instructors

CID	InstructorID	StartDate	EndDate	Location
101	1	2022-01-15	2022-05-10	Room 101
102	2	2022-02-20	2022-06-15	Lab 3, Building B
103	3	2022-03-10	2022-07-05	Room 201
104	4	2022-04-05	2022-08-20	Room 301
105	5	2022-05-15	2022-09-25	Lab 2, Building A

Course_Instrcutor_Mapping

CID	EnrolledStudents
101	25
102	30
103	20

104	22
105	28

Course_Enrollements