**BINOY BARNABAS**

**ILP BATCH 1**

DBMS assignment

**1.Employee information**

Since all the data is atomic it is in 1NF form.

EmployeeName, Salary, HireDate are fully dependent on employeeID so we split the table into employee table. This removes the partial dependency in the initial table.

**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 |

We can create a department table using departmentID, because otherwise If we delete a data from a table the department data is lost which causes deletion anomaly.

**Department table**

|  |  |
| --- | --- |
| departmentID | department |
| d1 | HR |
| d2 | IT |
| d3 | Sales |

Then we can create a mapping table based on employeeID from employee table and departmentID from department table along with the managerID from this table below. Since the table doesn’t have any other data related to manager I'm adding the managerID to the table directly.

**EmployeeDepartmentMapping** table

|  |  |  |
| --- | --- | --- |
| employeeID | departmentID | ManagerID |
| 1 | d1 | 101 |
| 2 | d2 | 102 |
| 3 | d3 | 101 |

**2. Training programs**

Removing the partial dependency by creating a new table called programs where programName and trainer are functionally dependent on programID.

|  |  |  |
| --- | --- | --- |
| programID | programName | Trainer |
| 1 | Java Fundamentals | John Smith |
| 2 | Project Management | Sarah White |
| 3 | Sales Techniques | Mark Johnson |

EmployeeID is dependent on programName and programName is dependent on programID which causes the transitive dependency. To remove the transitive dependecy we need to create a new table for employee which has employeeID, department and employeename as fields.

|  |  |  |
| --- | --- | --- |
| employeeId | department | employeename |
| 101 | IT | Alice Brown |
| 102 | HR | Bob Green |
| 103 | Sales | Charlie Black |

|  |  |  |
| --- | --- | --- |
| programID | employeeID | date |
| 1 | 101 | 2022-03-01 |
| 2 | 102 | 2022-03-10 |
| 3 | 103 | 2022-03-20 |

Further optimization: since department data can be lost if we remove any record from the employee table which leads to the deletion anomaly. So it’s better to create a new table for department which has departmentID and department. Thus it would results to 2 new changes.

Change in 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 |

This would be new department table which will help to resolve the deletion anomaly.

|  |  |
| --- | --- |
| departmentID | departmentNmae |
| d1 | IT |
| d2 | HR |
| d3 | Sales |

This is the programEmployeeDepartmentMapping table

|  |  |  |  |
| --- | --- | --- | --- |
| programID | employeeID | departmentID | date |
| 1 | 101 | d1 | 2022-03-01 |
| 2 | 102 | d2 | 2022-03-10 |
| 3 | 103 | d3 | 2022-03-20 |

**3. Customer orders**

Since the initial table is already in 1NF form because no multivalues attributes are there and all the data are atomic.

Removing the partial dependecy from the table by creating a new table for product using the fields productID, productName, unitPrice. Here the productName and unitPrice are functionally dependent on productID. This new table removes partial dependency from the table.

|  |  |  |
| --- | --- | --- |
| productID | productName | unitPrice |
| 101 | Laptop | 800 |
| 102 | Smartphone | 500 |
| 103 | Printer | 200 |

In the new table which has fields productID, orderID, customerName, qty, totalAmount, orderDate.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| productID | orderId | customerName | qty | totalAmount | orderDate |

customerName is fully dependent on orderID and orderID is fully dependent on productID which causes the transitive depency to exist. So to remove the transitive dependecy from the table we need to create a new table orders which has orderID, customerName, qty, totalAmount, orderDate. Thus we removes the transitive dependeny by creating orders table given below and made it upto to 3NF.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| orderId | customerName | qty | totalAmount | orderDate |
| 1 | John Doe | 2 | 1600 | 2022-01-15 |
| 2 | Jane Smith | 1 | 500 | 2022-02-20 |
| 3 | John Doe | 1 | 200 | 2022-03-10 |

The final table called the orderProductMapping where the products are mapped to orders in which the products are purchased.

orderProductMapping table

|  |  |
| --- | --- |
| orderid | productid |
| 1 | 101 |
| 2 | 102 |
| 3 | 103 |

4. Stress management

Since the initials table is already in the 1NF form.

We remove the partial dependency from the initial table by removing the firstName, lastName and employeeID as employee table where firstName and lastName are fully dependent on employeeID.

|  |  |  |
| --- | --- | --- |
| employeeeID | firstName | lastName |
| 101 | Sarah | White |
| 102 | Bob | Green |
| 103 | Charlie | Black |
| 104 | David | Miller |
| 105 | Jane | Doe |

Again hoursOfWork and BreaksTaken are functionally dependent on employeID so we create a new table called workingHours.

|  |  |  |
| --- | --- | --- |
| employeeID | hoursOfWork | BreaksTaken |
| 101 | 45 | 3 |
| 102 | 50 | 2 |
| 103 | 40 | 4 |
| 104 | 48 | 1 |
| 105 | 42 | 3 |

StressLevel, PhysicalActivity and counsellingSession are associated with employeeID. So we are again creating a new table called stressManagement.

StressLevel data have duplication, so we can create a new table for that.

This is the stress table

|  |  |
| --- | --- |
| stressMark | stressLevel |
| 1 | low |
| 2 | moderate |
| 3 | high |

The mapping table which mapps stressLevel to employeeID, PhysicalActivity and counsellingSession.

|  |  |  |  |
| --- | --- | --- | --- |
| employeeID | stressLevel | PhysicalActivity | counsellingSesssion |
| 101 | 2 | yoga | 2 |
| 102 | 3 | joggin | 1 |
| 103 | 1 | meditation | 3 |
| 104 | 3 | gym | 2 |
| 105 | 2 | walking | 1 |

Now the table is normalized.

5. Flea market

The initial table is already in 1NF. Removing the partial dependency by creating a new table called sellers which has the sellerID, sellerName and also the location. Here the sellerName and location is fullydependent on the key sellerID. Thus remove the partial dependency. Hence the normalized version is given below. One table is for the items and other table is called seller, where the sellerID in the items table in referenced from the seller table using foreign key contraints.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| itemID | sellerId | itemName | category | price | quantity | description | condition | dateListed |
| 101 | s1 | Vintage chair | Furniture | 50.00 | 2 | Beautiful vintage  chair, excellent  condition | Lik new | 2022-01-15 |
| 102 | s2 | Antique clock | Home Decor | 80.001 | 1 | Authentic  antique clock  with Roman  numerals | good | 2022-02-20 |
| 103 | s3 | Vinyl Records | Music | 15.00 | 10 | Various artists  and genres, in  good condition | used | 2022-03-10 |
| 104 | s4 | Vintage Jewelery | Accessories | 35.00 | 5 | Assorted vintage  jewelry pieces,  unique designs | excellent | 2022-04-05 |
| 105 | s5 | Retro Camera | Electronics | 60.00 | 1 | Vintage Polaroid  camera with  original case | good | 2022-05-15 |

|  |  |  |
| --- | --- | --- |
| sellerID | sellerName | location |
| s1 | John’s Treasure | Booth 15, section A |
| s2 | Alice’s Finds | Stall 8, section B |
| s3 | Mark’s collectibles | Booth 20, Section C |
| s4 | Emma’s Treasure | Stall 12, Section D |
| s5 | Robert’s Find | Booth 5, Section A |

**6. Learning management system**

Removing partial dependency. Creating a course table where courseName and credits are fully dependent on CID.

|  |  |  |
| --- | --- | --- |
| CID | courseName | credits |
| 101 | Introduction to biology | 3 |
| 102 | Programming in python | 4 |
| 103 | Financial accounting | 3 |
| 104 | English literature | 3 |
| 105 | Web development fundamentals | 4 |

Removing transitive dependency, that is instructor is functionally dependent on courseName and courseName is fully dependent on CID. So we are creating another table for instructor to remove the transitive dependency. The new table is shown below

|  |  |
| --- | --- |
| InstructorID | instructor |
| c1 | Prof. smith |
| c2 | Prof. brown |
| c3 | Prof. green |
| c4 | Prof. white |
| c5 | Prof. Black |

Removing transitive dependency, that is department is functionally dependent on instructorID and instructorID is fully dependent on CID. So we are creating another table for department to remove the partial dependency. The new table is shown below

|  |  |
| --- | --- |
| departmentID | department |
| d1 | science |
| d2 | Computer science |
| d3 | finance |
| d4 | humanities |
| d5 | IT |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CID | instructorID | departmentID | Enrolled students | Start date | End date | location | availability |
| 101 | c1 | d1 | 25 | 2022-01-15 | 2022-05-10 | Room 101 | open |
| 102 | c2 | d2 | 30 | 2022-02-20 | 2022-06-15 | Lab 3, building B | closed |
| 103 | c3 | d3 | 20 | 2022-03-10 | 2022-07-05 | Room 201 | open |
| 104 | c4 | d4 | 22 | 2022-04-05 | 2022-08-20 | Room 301 | open |
| 105 | c5 | d5 | 28 | 2022-05-15 | 2022-09-25 | Lab 2, building A | closed |