FSDM / CPCM – 2023S

Database Design & SQL

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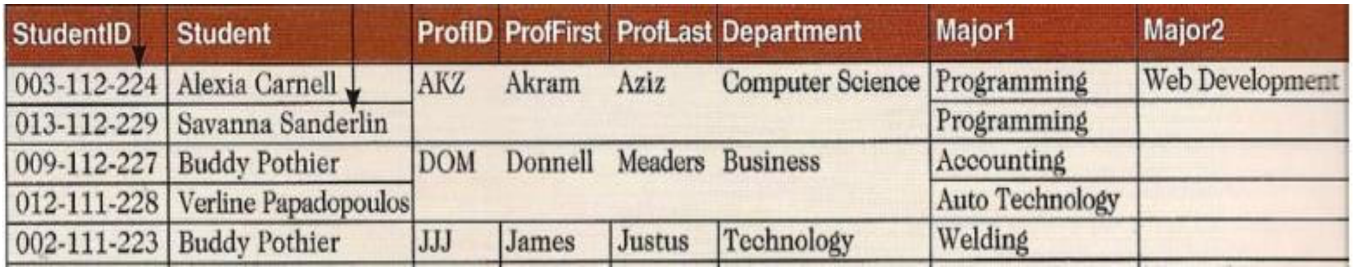
Practical Exercise 9_10_11_12



StudentID	Student	ProfID	ProfFirst	ProfLast	Department	Major1	Major2
003-112-224	Alexia Carnell	AKZ	Akram	Aziz	Computer Science	Programming	Web Development
013-112-229	Savanna Sanderlin					Programming	
009-112-227	Buddy Pothier	DOM	Donnell	Meaders	Business	Accounting	
012-111-228	Verline Papadopoulos					Auto Technology	
002-111-223	Buddy Pothier	JJJ	James	Justus	Technology	Welding	

Practical Activity #1

1. **Criteria for 1NF**

    - There shouldn't be any repeating groupings in the table.
    - There shouldn't be any multivalued columns in any table.
    - A primary key need to be specified.

2. **Criteria for 2NF**

    - The table must satisfy all requirements to be in 1NF.
    - A table should not be partially dependent on any other tables.

3. **Criteria for 3NF**

    - Table must meet all requirements to be in 2NF.
    - The value of any non-key columns should not depend on any other non-key columns.

Practical Activity #2

Apply the criteria and normalize the above table into 1NF:

The table shouldn't have two or more related or similar-data-containing columns, as per the requirements listed for the table to be in 1NF. Two columns in the supplied table, **“Major”1** and **“Major2”**, appear to contain the same type of data, indicating that they include repeated groups of data. To alleviate this problem and fulfil the first requirement for 1NF, a new table can be created to record the **“Major”** In a similar way, the second requirement for a table to be in 1NF is that it cannot contain any multivalued columns. Since the given table does not contain any multivalued columns, we can move on to the final requirement, which is defining a primary key for the table. We can utilise **StudentID**, a unique primary key, in the table that is provided. After applying all the requirements for 1NF, the new updated table can be visualized as below:

1. **Create a separate table to combine and store value of “Major1” and “Major2”.**

MajorID	**Major**
M1	Programming
M2	Web Development
M3	Programming
M4	Web Development
M5	Accounting
M6	Web Development
M7	Auto Technology
M8	Web Development
M9	Welding
M10	Web Development

2. **Create table to store other remaining data.**

StudentID	**Student**	**ProfID**	**ProfFirst**	**ProfLast**	**Department**
003-112-224	Alexia Carnell	AKJ	Akram	Aziz	Computer Science
013-112-229	Savanna Sanderlin	AKJ	Akram	Aziz	Computer Science
009-112-227	Buddy Pothier	DOM	Donnell	Meaders	Business
012-111-228	Verline Papadopoulos	DOM	Donnell	Meaders	Business
002-111-223	Buddy Pothier	JJJ	James	Justus	Technology

3. **Create table to link the remaining data in the table and newly created table to store major using “StudentID” as primary key.**

MajorID	StudentID
M1	003-112-224
M2	003-112-224
M3	013-112-229
M4	013-112-229
M5	009-112-227
M6	009-112-227
M7	012-111-228
M8	012-111-228
M9	002-111-223
M10	002-111-223

Practical Activity #3

Apply the criteria and normalize the above table into 2NF:

A table must initially fulfil every prerequisite for being in **1NF** before it can be in **2NF**. The given table has already been normalised to **1NF** in this case, therefore we may move on to the next criterion. The final standard for a table. The table in **2NF** should not have any partial dependencies; instead, we must ensure that all the non-key columns already in existence are solely dependent on the primary key. According to the provided table, it appears that there are partial dependencies; the non-key characteristics linked to professor information, such as **ProfID**, **ProfFirst**, and **ProfLast**, should be reliant on the full primary key, i.e., **StudentID**, but they are only dependent on **ProfID**. So, to address this issue we can create a separate table to store information of professor and link with the existing table using **ProfID** as the primary key. After applying all the criteria for 2NF, the new updated table can be visualized as below:

1. **Create separate table to store information related to professor.**

ProfID	ProfFirst	ProfLast
AKJ	Akram	Aziz
DOM	Donnell	Meaders
JJJ	James	Justus

2. **Link the existing data table using ProfID as primary key.**

StudentID	Student	Department	***ProfID***
003-112-224	Alexia Carnell	Computer Science	AKJ
013-112-229	Savanna Sanderlin	Computer Science	AKJ

009-112-227	Buddy Pothier	Business	DOM
012-111-228	Verline Papadopoulos	Business	DOM
002-111-223	Buddy Pothier	Technology	JJJ

3. **List down other remaining data table.**

MajorID	**Major**
M1	Programming
M2	Web Development
M3	Programming
M4	Web Development
M5	Accounting
M6	Web Development
M7	Auto Technology
M8	Web Development
M9	Welding
M10	Web Development

MajorID	**StudentID**
M1	003-112-224
M2	003-112-224
M3	013-112-229
M4	013-112-229
M5	009-112-227
M6	009-112-227
M7	012-111-228
M8	012-111-228
M9	002-111-223
M10	002-111-223

Practical Activity #4

Apply the criteria and normalize the above table into 3NF:

According to the normalisation principles, a table must first meet every need of **2NF** to satisfy the conditions of **3NF**. Furthermore, no non-key value column should be used to determine the value of another non-key value column. Here, after normalising the given table to **2NF**, we can observe that there is a transitive relationship between the **"Department"** column and the professor detail, **"ProfID"** which is not a primary key. As a result, we can make a new table with **"DepartmentID**" as its primary key to contain information about departments to end this reliance. And after completing all the steps applying all criteria for **3NF** the final tables can be visualised as shown:

1. **Students table to store information related to student.**

StudentID	**Student**	***ProfID***	**DepartmentID**
003-112-224	Alexia Carnell	AKJ	C100
013-112-229	Savanna Sanderlin	AKJ	C100
009-112-227	Buddy Pothier	DOM	B101
012-111-228	Verline Papadopoulos	DOM	B101
002-111-223	Buddy Pothier	JJJ	T102

2. **Major table to store information about majors.**

MajorID	**Major**
M1	Programming
M2	Web Development
M3	Programming
M4	Web Development
M5	Accounting
M6	Web Development
M7	Auto Technology
M8	Web Development
M9	Welding
M10	Web Development

3. **StdMajor table to link students table to major table.**

MajorID	**StudentID**
M1	003-112-224
M2	003-112-224

M3	013-112-229
M4	013-112-229
M5	009-112-227
M6	009-112-227
M7	012-111-228

4. **Professors table to store information about professor.**

ProfID	**ProfFirst**	**ProfLast**
AKJ	Akram	Aziz
DOM	Donnell	Meaders
JJJ	James	Justus

5. **Department table to store information related to departments.**

DepartmentID	**Department**
C100	Computer Science
B101	Business
T10Z	Technology