**Example of UNF**

| Player Name | Address | Clubs | Rank Name |
| --- | --- | --- | --- |
|  |  |  |  |
| Lionel Messi | Catalonia | FC Barcelona | Commander BE |
| Neymar Jr | Paris | Paris SG, FC Barcelona | Member BE |
| Alex Morgan | Madrid | Bayern CF, Real CF | Member BE |
| Neymar Jr | Manchester | Manchester Utd | Order BE |

Table1 : Unnormalized Form (UNF)

The table above is an example of unnormalized form. It consists of multivalued attributes in same tuple due to which it lacks efficiency and may face multiple issues like data redundancy or anomalies. Hence, it should be further normalized.

**1NF**

| Player Name | Address | Clubs | Rank Name |
| --- | --- | --- | --- |
|  |  |  |  |
| Lionel Messi | Catalonia | FC Barcelona | Commander BE |
| Neymar Jr | Paris | Paris SG | Member BE |
| Neymar Jr | Paris | FC Barcelona | Member BE |
| Alex Morgan | Madrid | Bayern CF | Member BE |
| Alex Morgan | Madrid | Real CF | Member BE |
| Neymar Jr | Manchester | Manchester Utd | Order BE |

Table 2 : First Normalized Form (1NF)

After the table is normalized into first normal form by following required conditions, each tuple must be unique. In table above, there are two players with same name, therefore we need to consider both name and address to identify a tuple uniquely. Doing that will create a composite key, which is a primary key composed of numerous columns to determine a tuple distinctively.

**2NF**

| Player Registration No. | Player Name | Address | Rank Name |
| --- | --- | --- | --- |
|  |  |  |  |
| FIFA1001 | Lionel Messi | Catalonia | Commander BE |
| FIFA1002 | Neymar Jr | Paris | Member BE |
| FIFA1003 | Alex Morgan | Madrid | Member BE |
| FIFA1004 | Neymar Jr | Manchester | Order BE |

Table 3.1 : Player Information Table

| Player Registration No. | Clubs |
| --- | --- |
|  |  |
| FIFA1001 | FC Barcelona |
| FIFA1002 | Paris SG |
| FIFA1002 | FC Barcelona |
| FIFA1003 | Bayern CF |
| FIFA1003 | Real CF |
| FIFA1004 | Manchester Utd |

Table 3.2 : Club Information Table

As there was no other ways to simplify the table, we need to divide the table into two different tables. With this, The first table displays information about players while the second one displays club information. A new column named ‘Player registration No.’ is introduced as a primary key so that the data can be uniquely identified.

* **Player Registration No. Is the foreign Key in Club Information table**

In Club Information Table (Table 3.2), Player Registration Table is the foreign key.

A foreign key is basically a set of attributes that is accustomed as a reference of primary key in discrete table. It is used to connect two tables together. In Table 3.2, Player Registration No. Is referred as a foreign key which was primary key column in Table 3.1 (Player Information Table).

**3NF**

| Player Registration No. | Player Name | Address | Rank Name |
| --- | --- | --- | --- |
|  |  |  |  |
| FIFA1001 | Lionel Messi | Catalonia | Commander BE |
| FIFA1002 | Neymar Jr | Paris | Member BE |
| FIFA1003 | Alex Morgan | Madrid | Member BE |
| FIFA1004 | Neymar Jr | Manchester | Order BE |

Table 4.1

There is transitive dependency between Player’s Name and Rank Name. The Rank Name is dependent upon Player Name. Modifying the name of player may alter the rank name of the player too. Hence, there is transitive dependency present in the table which does not fulfill the condition of Third Normal Form.

Conversion into **3NF,**

| Player Registration No. | Player Name | Address | Rank Name ID |
| --- | --- | --- | --- |
|  |  |  |  |
| FIFA1001 | Lionel Messi | Catalonia | CBE-1 |
| FIFA1002 | Neymar Jr | Paris | MBE-1 |
| FIFA1003 | Alex Morgan | Madrid | MBE-1 |
| FIFA1004 | Neymar Jr | Manchester | OBE-1 |

Table 4.2

| Player Registration No. | Clubs |
| --- | --- |
|  |  |
| FIFA1001 | FC Barcelona |
| FIFA1002 | Paris SG |
| FIFA1002 | FC Barcelona |
| FIFA1003 | Bayern CF |
| FIFA1003 | Real CF |
| FIFA1004 | Manchester Utd |

Table 4.3

| Rank Name ID | Rank Name |
| --- | --- |
|  |  |
| CBE-1 | FC Barcelona |
| MBE-1 | Paris SG |
| MBE-1 | FC Barcelona |
| OBE-1 | Bayern CF |

Table 4.4

Following rules and conditions of Third Normal Form, the table in 2NF is divided and new table is created. The new table stores Rank Name of each players. The Rank Name ID in Table 4.3 while it is foreign key in Table 4.1.

In this way a table is normalized up to Third Normal Form in order to avoid redundancies and data anomalies. There is no transitive dependency I.e, the table is in Third Normal Form.