**Assignment # 2**

**Assumption:** A client rents a given property only once and cannot rent more than one property at any one time. Rent finishing Date might be null.

# The Unnormalized Table (ClientRental)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **clientNo** | **cName** | **propertyNo** | **pAddress** | **rentStart** | **rentFinish** | **rent** | **ownerNo** | **oName** |
| CR76 | John  Kay    John  Kay | PG4      PG16 | 6 Lawrence  St, Glasgow    5 Novar Dr,  Glasgow | 1-Jul-12      1-Sep-13 | 31-Aug-13      1-Sep-14 | 350      450 | CO40      CO93 | Tina  Murphy    Tony  Shaw |
| CR56 | Aline  Stewart    Aline  Stewart    Aline  Stewart | PG4      PG36      PG16 | 6 Lawrence  St, Glasgow    5 Manor Rd, Glasgow    5 Novar Dr,  Glasgow | 1-Sep-11    10-Oct-12      1-Nov-14 | 10-June-12      1-Dec-13      10-Aug-15 | 350      375      450 | CO40    CO93      CO93 | Tina  Murphy    Tony  Shaw    Tony  Shaw |

As we can see that the cells of column propertyNo, pAddress, rentStart, rentFinish, rent, ownerNo, oName have multiple values hence the above table is in unnormalized form.

**1NF Table:**

To convert this table into first normal form (i.e., 1NF), we have to remove these repeating groups from this table.

# ClientRental

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **clientNo** | **cName** | **propertyNo** | **pAddress** | **rentStart** | **rentFinish** | **rent** | **ownerNo** | **oName** |
| CR76 | John  Kay | PG4 | 6 Lawrence  St, Glasgow | 1-Jul-12 | 31-Aug-13 | 350 | CO40 | Tina  Murphy |
| CR76 | John  Kay | PG16 | 5 Novar Dr,  Glasgow | 1-Sep-13 | 1-Sep-14 | 450 | CO93 | Tony  Shaw |
| CR56 | Aline  Stewart | PG4 | 6 Lawrence  St, Glasgow | 1-Sep-11 | 10-June-12 | 350 | CO40 | Tina  Murphy |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CR56 | Aline  Stewart | PG36 | 5 Manor Rd,  Glasgow | 10-Oct-12 | 1-Dec-13 | 375 | CO93 | Tony  Shaw |
| CR56 | Aline  Stewart | PG16 | 5 Novar Dr,  Glasgow | 1-Nov-14 | 10-Aug-15 | 450 | CO93 | Tony  Shaw |

The above table is in first normal form. In order to convert it into 2NF (Second Normal Form), we will first find the functional dependencies.

**FUNCTIONAL DEPENDENCIES:**

clientNo, propertyNo → cName, pAddress, rentStart, rentFinish, rent, oName, ownerNo (Primary Key) clientNo, rentStart → cName, propertyNo, pAddress, rentFinish, rent, oName, ownerNo (Candidate Key ) propertyNo, rentStart → clientNo, cName, pAddress, rentFinish, rent, oName, ownerNo(Candidate Key)

clientNo →cName (Partial Dependency)

propertyNo → pAddress, rent, ownerNo, oName (Partial Dependency)

ownerNo → oName (Transitive Dependency)

**2NF Tables:**

To convert 1NF to 2NF, we have to remove the partial dependencies from the above table which will convert the above table into the following 3 tables:

ClientRental (**clientNo, propertyNo**, rentStart, rentFinish)

Client (**clientNo**, cName)

Property (**propertyNo**, pAddress, rent, ownerNo, oName)

# ClientRental

|  |  |  |  |
| --- | --- | --- | --- |
| **clientNo** | **propertyNo** | **rentStart** | **rentFinish** |
| CR76 | PG4 | 1-Jul-12 | 31-Aug-13 |
| CR76 | PG16 | 1-Sep-13 | 1-Sep-14 |
| CR56 | PG4 | 1-Sep-11 | 10-June-12 |

|  |  |  |  |
| --- | --- | --- | --- |
| CR56 | PG36 | 10-Oct-12 | 1-Dec-13 |
| CR56 | PG16 | 1-Nov-14 | 10-Aug-15 |

# Client

|  |  |
| --- | --- |
| **clientNo** | **cName** |
| CR76 | John Kay |
| CR56 | Aline Stewart |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **propertyNo** | **pAddress** | **rent** | **ownerNo** | **oName** |
| PG4 | 6 Lawrence St,  Glasgow | 350 | CO40 | Tina Murphy |
| PG16 | 5 Novar Dr,  Glasgow | 450 | CO93 | Tony Shaw |
| PG36 | 5 Manor Rd,  Glasgow | 375 | CO93 | Tony Shaw |

# Property

The above tables are in second normal form.

**3NF Tables:**

In order to convert above tables into 3NF, we have to remove transitive dependency.

ClientRental and Client Tables have no transitive dependency hence they are already in 3NF. But to convert Property Table into 3NF, we have to remove the transitive dependency of oName on ownerName. Removing this would break Property table into the following 2 tables:

Property (**propertyNo**, pAddress, rent, ownerNo)

Owner (**ownerNo**, oName)

**Property**

|  |  |  |  |
| --- | --- | --- | --- |
| **propertyNo** | **pAddress** | **rent** | **ownerNo** |
| PG4 | 6 Lawrence St,  Glasgow | 350 | CO40 |
| PG16 | 5 Novar Dr,  Glasgow | 450 | CO93 |
| PG36 | 5 Manor Rd,  Glasgow | 375 | CO93 |

# Owner

|  |  |
| --- | --- |
| **ownerNo** | **oName** |
| CO40 | Tina Murphy |
| CO93 | Tony Shaw |

The above tables are now in third normal form.

# BCNF

In order to convert 3NF to BCNF, we have such a dependency in which a non-prime attribute functionally determines a prime attribute.

In above tables, there is no such dependency hence the tables are already in Boyce-Codd normal form.