**Normalized Relational Tables and Columns**

|  |  |  |
| --- | --- | --- |
| BuildingID | NoofFloors | SectorNo |

Building

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| StaffID | SSN | FirstName | LastName | StaffEmail |

Staff

|  |  |
| --- | --- |
| StaffID | StaffPhone |

StaffPhone

|  |  |
| --- | --- |
| BuildingID | StaffID |

Cleans

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CustID | FirstName | LastName | Address | MoneyAmount | ArtStylePref |

Customer

Artist

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ArtistID | FirstName | LastName | ArtStyle | PlaceofBirth | YearofBirth | ArtistPhone | CustID | ArtistIDInspiredby |

|  |  |
| --- | --- |
| ArtExID | CustID |

Likes

|  |  |  |  |
| --- | --- | --- | --- |
| ArtExID | ArtExDate | BuildingID | ArtistID |

ArtExhibition

|  |  |  |  |
| --- | --- | --- | --- |
| BuildingID | RoomNo | ArtWorkCount | ArtistID |

Room

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PaintingID | PaintingName | PaintedStyle | PaintedYear | ArtExID | CustID |

Painting

|  |  |  |  |
| --- | --- | --- | --- |
| VisitorID | VisitingDate | VisitorPhone | CustomerPass |

Visitor

|  |  |  |
| --- | --- | --- |
| ArtExID | VisitorID | TimeStayed |

Visits

**Explaining the Process of Normalization**

The normalization process until the Boyce-Codd Normal form is a 4-step procedure that goes through 1NF,2NF,3NF, until it reaches the Boyce-Codd in that order. On each of these 4-steps, more conditions are added which needs to be satisfied in order to be defined as normalized in that form. Every table in a database must be normalized to a certain normalized form for the database to be considered normalized in that form.

**1NF** – Each table needs to have a primary key and all the rows for each table must be unique. None of the values in a table can be multivalued.

**2NF** – Needs to be in 1NF form and additionally must not contain partial functional dependencies. Partial functional dependencies occur when a column in a table depends on a component of a composite primary key. If a table does not contain a composite primary key, partial functional dependencies do not exist.

**3NF** – Needs to be in 2NF form and additionally must not contain transitive functional dependencies. Transitive functional dependencies occur when a non-key column in a table is dependent on another non-key column of that same table.

**Boyce-Codd** – Needs to be in 3NF form and additionally only full key functional dependencies exists. This means that the only thing that all the non-key columns in a table is fully dependent on is the primary key or a composite primary key.

**Reason why all my relations in the database is already in the Boyce-Codd Normal form and does not need any more changes**

1NF – All the relations in the database contains a primary key and every row is unique. There are no values in any of the tables that are multivalued. **1NF is satisfied**.

2NF –

The relations Building, Staff, Customer, Artist, ArtExhibition, Painting, and Visitor do not have composite primary keys therefore partial functional dependencies do not exist for these relations.

The relations Cleans, StaffPhone, Likes have composite primary keys but do not have columns that depends on any of the primary key components.

The relations Room and Visits have composite primary keys but the columns are dependent on the composite primary keys and not any of the components.

**2NF is satisfied.**

3NF – None of the relations in the database contains non key columns that depends on other non key columns so transitive functional dependencies do not exist. **3NF is satisfied.**

Boyce-Codd NF –

The relations Building, Staff, Customer, Artist, ArtExhibition, Painting, and Visitor contains a single primary key that determines the rest of the columns so it has a full key functional dependency and there are no other functional dependencies.

The relations Cleans, StaffPhone, Likes have composite primary keys but do not have columns that depends on any of the primary key components.

The relations Room and Visits have composite primary keys that determines their respective columns so it has a full key functional dependency and there are no other functional dependencies.

**Boyce-Codd NF is satisfied.**

**The database is in Boyce-Codd NF and no further changes are necessary.**