**Second Normal Form (2NF):**

* Rule 1- Be in 1NF (it states that an attribute of a table cannot hold multiple values. It must hold only single-valued attribute.)
* Rule 2- Single Column Primary Key that does not functionally dependant on any subset of **candidate key relation.**

**Eg:** A school can store the data of teachers and the subjects they teach. In a school, a teacher can teach more than one subject.

|  |  |  |
| --- | --- | --- |
| **Teacher Id** | **Subject** | **Age** |
| Saikumar | English | 22 |
| Chaitanya | Sanskrit | 35 |
| Vamshi | Maths | 24 |
| Venkat | Physics | 30 |
| Chaitanya | Hindi | 35 |

To convert the given table into 2NF, we decompose it into two tables:

**Teacher Details table:**

|  |  |
| --- | --- |
| **Teacher Id** | **Age** |
| **Saikumar** | **22** |
| **Chaitanya** | **35** |
| **Vamshi** | **24** |
| **Venkat** | **30** |

|  |  |
| --- | --- |
| **Teacher Id** | **Subject** |
| **Saikumar** | **English** |
| **Chaitanya** | **Sanskrit** |
| **Vamshi** | **Maths** |
| **Venkat** | **Physics** |
| **Chaitanya** | **Hindi** |

**Teacher Subject Table:**

**THIRD NORMAL FORM (3NF):**

* A relation will be in 3NF if it is in 2NF and not contain any transitive partial dependency.
* 3NF is used to reduce the data duplication. It is also used to achieve the data integrity.
* If there is no transitive dependency for non-prime attributes, then the relation must be in third normal form.

A relation is in third normal form if it holds atleast one of the following conditions for every non-trivial function dependency X → Y.

1. X is a super key.
2. Y is a prime attribute, i.e., each element of Y is part of some candidate key.

**EG: STUDENT TABLE:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **STUDENT ID** | **STUDENT NAME** | **AREA CODE** | **CITY** | **STATE** |
| **101** | **SAI** | **121212** | **HYDERABAD** | **TELANAGANA** |
| **102** | **GANESH** | **121121** | **NALGONDA** | **ANDHRAPRADESH** |
| **103** | **BUNNY** | **2362362** | **CHENNAI** | **TAMILNADU** |
| **104** | **JAYA** | **2323322** | **MUMBAI** | **MAHARASTRA** |

**Super key in the table above:**

{STUDENTID}, {STUDENTID, STUDENTNAME}, {STUDENTID,STUDENTNAME,STUDENT AREACODE}…………………….

**Candidate key:** {STUDENT ID}

**Non-prime attributes:**  All attributes except STUDENT ID are non-prime.

**STUDENT TABLE:**

|  |  |  |
| --- | --- | --- |
| **STUDENT ID** | **STUDENT NAME** | **AREACODE** |
| **101** | **SAI** | **121212** |
| **102** | **GANESH** | **121121** |
| **103** | **BUNNY** | **2362362** |
| **104** | **JAYA** | **2323322** |

**STUDENT AREA:**

|  |  |  |
| --- | --- | --- |
| **AREA CODE** | **CITY** | **STATE** |
| **121212** | **HYDERABAD** | **TELANAGANA** |
| **121121** | **NALGONDA** | **ANDHRAPRADESH** |
| **2362362** | **CHENNAI** | **TAMILNADU** |
| **2323322** | **MUMBAI** | **MAHARASTRA** |