**2NF and 3NF with examples**

* **2NF:**

Student

|  |  |  |
| --- | --- | --- |
| Stud\_id | Stud\_name | address |
|  |  |  |

Subject

|  |  |
| --- | --- |
| Sub\_id | Sub\_name |
|  |  |

Score

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Score\_id | Stud\_id | Sub\_id | Marks | Teacher |
|  |  |  |  |  |

* As we can see; we have 3 tables.
* And in “Score “ table, stud\_id & sub\_id are the **“Foreign key”** together forming a **“Candidate key”**.
* As we can see here that the “marks“ depends on both(stud\_id, sub\_id) but the “teacher” depends on the “sub\_id” viz already a part of a **Candidate key**.
* In a case, **where a non-prime attribute depends on a part of a Candidate key. Such scenario is called as “Partial Dependency”.**
* We need to rectify this mistake and hence we try to eliminate this column from the table.
* Therefore, our new table will be as follows:-

Subject

|  |  |  |
| --- | --- | --- |
| Sub\_id | Sub\_name | Teacher |
|  |  |  |

* Since, “teacher” only depends on the subject they teach that is why we have concatenated “teacher” column into “subject” table.
* And this was the 2nd NF.
* **3NF:**

Score

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score\_id | Stud\_id | Sub\_id | Marks | Exam\_name | Total\_mks |
| 101 | 201 | 1 | 35 | Mid\_sem | 50 |
| 102 | 202 | 2 | 62 | Final\_sem | 100 |

* Here, as we can see “score\_id” is the **Primary key**, stud\_id & sub\_id together forms a **Candidate key**.
* Other than these 3 all are **non-prime attributes**.
* Here, the “total\_mks” clearly depends on the “exam\_name”. As the “exam\_name” changes so does the “total\_mks”.
* But here, neither the “exam\_name” nor the “total\_mks” is a **primary key**; that is they are the **non-prime attributes**.
* In such a case, **where one non-prime attribute depends on another non-prime attribute rather than depending on the prime attribute is called “Transitive dependency”**.
* To overcome this we may need to split the table into 2 or more tables. Coz if we try to Update, Insert or Delete any record will raise in **Anomalies**.
* So, we’ll have one table as “Score” and another as “Exam”.

Score

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Score\_id | Stud\_id | Sub\_id | Marks | Exam\_id |
|  |  |  |  |  |

Exam

|  |  |  |
| --- | --- | --- |
| Exam\_id | Exam\_name | Total\_mks |
|  |  |  |

* And this was the 3rd NF.