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## 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  $X \rightarrow Y$ .

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

### Example:

#### EMPLOYEE\_DETAIL table:

| EMP_ID | EMP_NAME | EMP_ZIP | EMP_STATE | EMP_CITY |
|--------|----------|---------|-----------|----------|
| 222    | Harry    | 201010  | UP        | Noida    |
| 333    | Stephan  | 02228   | US        | Boston   |
| 444    | Lan      | 60007   | US        | Chicago  |

|     |           |        |    |         |
|-----|-----------|--------|----|---------|
| 555 | Katharine | 06389  | UK | Norwich |
| 666 | John      | 462007 | MP | Bhopal  |

**Super key in the table above:**

{EMP\_ID}, {EMP\_ID, EMP\_NAME}, {EMP\_ID, EMP\_NAME, EMP\_ZIP}....so on

**Candidate key:** {EMP\_ID}

**Non-prime attributes:** In the given table, all attributes except EMP\_ID are non-prime.

Here, EMP\_STATE & EMP\_CITY dependent on EMP\_ZIP and EMP\_ZIP dependent on EMP\_ID. The non-prime attributes (EMP\_STATE, EMP\_CITY) transitively dependent on super key(EMP\_ID). It violates the rule of third normal form.

That's why we need to move the EMP\_CITY and EMP\_STATE to the new <EMPLOYEE\_ZIP> table, with EMP\_ZIP as a Primary key.

**EMPLOYEE table:**

| EMP_ID | EMP_NAME | EMP_ZIP |
|--------|----------|---------|
| 222    | Harry    | 201010  |
| 333    | Stephan  | 02228   |

|     |           |        |
|-----|-----------|--------|
| 444 | Lan       | 60007  |
| 555 | Katharine | 06389  |
| 666 | John      | 462007 |

**EMPLOYEE\_ZIP table:**

| EMP_ZIP | EMP_STATE | EMP_CITY |
|---------|-----------|----------|
| 201010  | UP        | Noida    |
| 02228   | US        | Boston   |
| 60007   | US        | Chicago  |
| 06389   | UK        | Norwich  |
| 462007  | MP        | Bhopal   |

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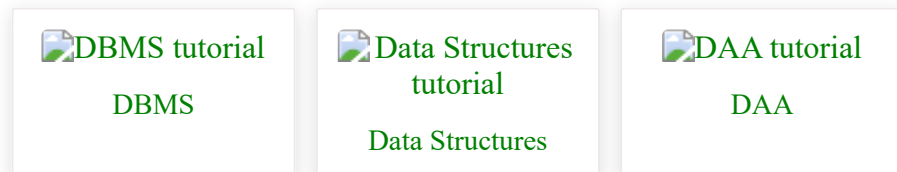
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