

# Normalization in DBMS

Student

| studid | course                       | mail id          |
|--------|------------------------------|------------------|
| 101    | FSDA, FSDS<br>m2, one nation | sudh@gmail.com   |
| 102    | RL, DL, FSDA                 | ksrish@gmail.com |
| 101    | MERN                         |                  |

| studid | mail             |
|--------|------------------|
| 101    | sudh@gmail.com   |
| 102    | ksrish@gmail.com |

| courses    | courseid | studid |
|------------|----------|--------|
| FSDA, FSDS | 1        | 101,   |
| m2         | 2        | 102    |
| one nation | 3        | 101    |
| MERN       | 5        | 102    |

1NF

2NF

3NF

BCNF

4NF

5NF

6NF

① 1NF → First Normal Form

① All the records in table should be unique.

② Each table cell should contain only one value.

Student

| id  | course       | Name   | Contact | mailid     |
|-----|--------------|--------|---------|------------|
| 101 | FSDA FSDS    | Sudh   | 0001    | sudh@xyz   |
| 102 | m2, DL, FSDA | ksrish | 0002    | ksrish@xyz |
| 101 | FSDA, BA     | Sudh   | 0001    | sudh@xyz   |
| 101 | FSDA, BA     | Sudh   | 0001    | sudh@xyz   |

|   | id  | course      | Name  | contact | mail id   |
|---|-----|-------------|-------|---------|-----------|
| 0 | 101 | <u>FSDA</u> | Sudh  | 001     | sudh@xyz  |
| 1 | 101 | FSDS        | Sudh  | 0001    | sudh@xyz  |
| 2 | 102 | im2         | Kaish | 0002    | kaish@xyz |
| 3 | 102 | PC          | Kaish | 0002    | kaish@xyz |
| 4 | 102 | FSDA        | Kaish | 0002    | kaish@xyz |
| 5 | 101 | BA          | Sudh  | 0001    | Sudh@xyz  |

1NF

2NF

- ① Apply 1NF
- ② Single Column Primary key does not functionally depend on any subset of candidate key.

PK

- ① must be unique
- ② it should not be null

= Composite key  $\rightarrow$  PK (col1, col2)

PKX → (CIC) ↓

| ID | Name   | course | Contact | marks |
|----|--------|--------|---------|-------|
| 1  | Sudh   | FSDA   | 9001    | 50    |
| 2  | Krish  | FSDS   | 9002    | 70    |
| 3  | Sudh   | BA     | 9001    | 40    |
| 4  | Ganesh | m2     | 9003    | 90    |
| 5  | New    | m2     | 9004    | 70    |

(INF) ✓

PK → (FK) ← course\_detail

| id | Name   | Contact | marks |
|----|--------|---------|-------|
| 1  | Sudh   | 9001    |       |
| 2  | Krish  | 9002    |       |
| 3  | Ganesh | 9003    |       |
| 4  | New    | 9004    |       |

| id | course |
|----|--------|
| 1  | FSDA   |
| 1  | BA     |
| 2  | FSDS   |
| 3  | m2     |
| 4  | m2     |

(FK) marks

| id | marks | course |
|----|-------|--------|
| 1  | 50    | FSDA   |
| 1  | 40    | BA     |
| 2  | 70    | FSDS   |
| 3  | 90    | m2     |
| 4  | 70    | m2     |

3NF  $\rightarrow$  Third Normal Form

① Apply 2NF

② It should not have any kind of transitive functional dependencies.

| Name  | degree  | id  |
|-------|---------|-----|
| Sudh  | B.tech  | 101 |
| Amogh | B.tech  | 102 |
| Sunny | M.tech. | 103 |

PK

1NF

2NF

Amogh  $\rightarrow$  MCA

| id  | Name  | degree |
|-----|-------|--------|
| 101 | Sudh  | 1      |
| 102 | Amogh | 1      |
| 103 | Sunny | 2      |

PK

FK

| degree id | degree Name |
|-----------|-------------|
| 1         | B.tech      |
| 2         | M.tech      |
| 3         | MCA         |

PK

(Amogh)

# BCNF (Boyce-Codd Normal Form)

(3.5 NF)

- ① must be 3NF
- ② DB will end up generating anomalies/outliers if it will be having more than one candidate key.

| Zoom-id | Start time | End time | Batch    |
|---------|------------|----------|----------|
| 1       | 8 AM       | 10 AM    | Big data |
| 2       | 9 AM       | 11 AM    | FSDA     |
| 3       | 10 AM      | 12 PM    | Java     |
| 4       | 6 PM       | 7 PM     | Big data |
| 1       | 7 PM       | 10 PM    | FSDA     |

Diagram labels and arrows:

- PK** (Primary Key) points to the **Zoom-id** column.
- CPK** (Candidate Key) points to the **Start time** column.
- EPK** (Candidate Key) points to the **End time** column.
- Composite PK** points to the **Start time** and **End time** columns.
- CPK** (Candidate Key) points to the **Batch** column.

# Pivot table ✓

↓

| Name   | Batch  | No of class |
|--------|--------|-------------|
| Sudh   | FSDA   | 10          |
| Kaish  | FSDS   | 20          |
| Sunny  | MLops  | 30          |
| Aumish | devops | 10          |
| Sudh   | FSDS   | 12          |
| Sudh   | BD     | 15          |

✓

|        | FSDS | FSDA | MLops | devops | BD | 10<br>Total | 20<br>class | 30 |
|--------|------|------|-------|--------|----|-------------|-------------|----|
| Sudh   | T    | T    | F     | F      | T  | 32          |             |    |
| Kaish  | T    | F    | F     | F      | F  | 20          |             |    |
| Sunny  | F    | F    | T     | F      | F  | 30          |             |    |
| Aumish | F    | F    | F     | T      | F  | 10          |             |    |

↓ orig

| Student Name | class | No |
|--------------|-------|----|
| Abhi         | FSDS  | 50 |
| Abhi         | FSDR  | 60 |
| Abhi         | BD    | 70 |
| Abhi         | OPS   | 20 |
| vaibh        | FSDS  | 50 |
| vaibh        | FSDR  | 60 |

Pivot

| name  | FSDS | FSDR | BD        | OPS |
|-------|------|------|-----------|-----|
| Abhi  | 50   | 60   | 70        | 20  |
| vaibh | 50   | 60   | NULL NULL |     |