Intro to NORMAL FORM

- **FIRST NORMAL FORM**

  - 1NF is the initial step of database normalization.

  - Implications of first normal form
    - **Atomic Values**: Each cell in a table contains indivisible, atomic values. Means a Relation should not contain any multivalued or composite attributes.

    - **Unique Columns**: Each column must have a distinct name to identify the data it contains.

    - **Primary Key**: A table in 1NF should have a primary key that uniquely identifies each record.

    - **Eliminating Duplicates**: Duplicate rows are removed to prevent data redundancy.

Prime attribute: - A attribute is said to be prime if it is part of any of the candidate key

Non-Prime attribute: - A attribute is said to be non-prime if it is not part of any of the candidate key.

Eg R(ABCD) AB→CD

Here candidate key is AB so, A and B are prime attribute, C and D are non-prime attributes.

PARTIAL DEPENDENCY**-** When a non – prime attribute is dependent only on a part (Proper subset) of candidate key then it is called partial dependency. (PRIME > NON-PRIME)

Full DEPENDENCY**-** When a non – prime attribute is dependent on the entire candidate key then it is called Full dependency.

- e.g. R(ABCD)
  - AB→D
  - A→C

SECOND NORMAL FORM

- Relation R is in 2NF if,
  - R should be in 1 NF.
  - R should not contain any Partial dependency. (that is every non-prime attribute should be fully dependent upon candidate key)

A	B	C
a	1	X
b	2	Y
a	3	Z
C	3	Z
D	3	Z
E	3	Z

A	B
A	1
B	2
A	3
C	3
D	3
E	3

B	C
1	X
2	Y
3	z

Q R(A, B, C)
B→C

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01

TRANSITIVE DEPENDENCY – A functional dependency from non-Prime attribute to non-Prime attribute is called transitive

02

E.g.- R(A, B, C, D) with A as a candidate key A→B

03

B→C [transitive dependency]

C→D [transitive dependency]

THIRD NORMAL FORM

Let R be the relational schema, it is said to be in 3 NF

- R should be in 2NF
- It must not contain any transitive dependency

THIRD NORMAL FORM DIRECT DEFINATION

- A relational schema R is said to be 3 NF if every functional dependency
- in R from α-->β, either α is super key or β is the prime attribute

R(A, B, C)

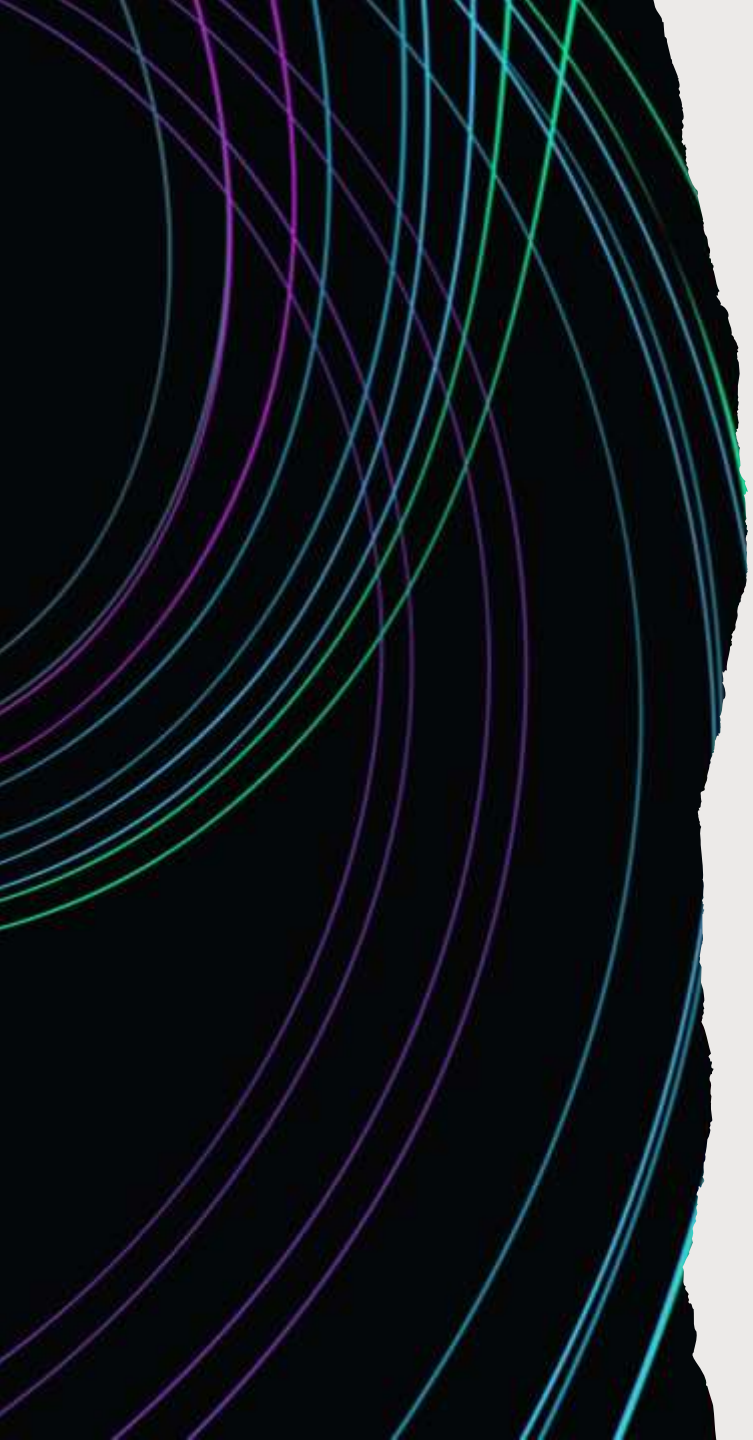
A → B

B → C

A	B	C
A	1	P
B	2	Q
C	2	Q
D	2	Q
E	3	R
F	3	R
G	4	S

A	B
A	1
B	2
C	2
D	2
E	3
F	3
G	4

B	C
1	P
2	Q
3	R
4	S



BCNF (BOYCE CODD NORMAL FORM)

A relational schema R is said to be BCNF if every functional dependency in R from

- $\alpha \rightarrow \beta$
- α must be a super key

R(A, B, C)

AB → C

C → B

A	B	C
A	C	B
B	B	C
B	A	D
A	A	E
C	C	B
D	C	B
E	C	B
F	C	B

A	B
A	B
B	B
B	A
A	A
C	C
D	C
e	C
f	c

C	B
B	C
C	B
D	A
E	A

Some important note points on Normalization:

- A Relation with two attributes is always in BCNF.
- A Relation schema R consist of only prime attributes then R is always in 3NF, but may or may not be in BCNF.