

DATABASE MANAGEMENT SYSTEM
ASSIGNMENT-2

① $F = \{ AB \rightarrow D, AC \rightarrow BD, B \rightarrow C \}$

$(AB)^+ = ABDC$

$(AC)^+ = ACBD$

Candidate Key = $\{ AB, AC \}$

Prime Attributes = $\{ A, B, C \}$

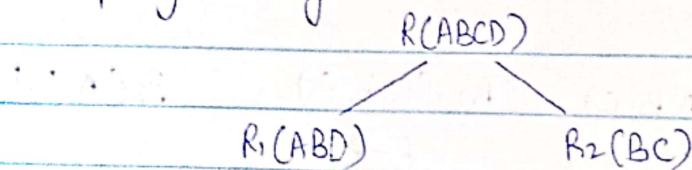
Non-Prime Attributes = $\{ D \}$

This is already in 3NF.

- It is in 2NF (No partial Dependencies)
- AB and AC are candidate Keys.
- C is a prime attribute.

But it is not in BCNF since in $B \rightarrow C$, B is not a candidate Key.

Decomposing we get:



Now in R_2 B is a candidate Key. So the tables are in BCNF.

② $R(A, B, C, D, E, F)$

$FD = \{ AC \rightarrow B, BD \rightarrow F, F \rightarrow CE \}$

$(ADC)^+ = ADCBFE$

$(ADB)^+ = ADBFCE$

$(ADF)^+ = ADFCEB$

$(ADE)^+ = ADE$

(i) R has 3 candidate keys

(ii) Candidate keys of R:

$\{(A, D, B), (A, D, C), (A, D, F)\}$

(iii) Prime Attributes = $\{A, B, C, D, F\}$
Non-Prime Attributes = $\{E\}$

R is not in 3NF.

In $F \rightarrow CE$, F is not a candidate key & E is a non-prime attribute

(iv) All FD's $AC \rightarrow B$, $BD \rightarrow F$ and $F \rightarrow CE$ violate BCNF since AC, BD and F are not candidate keys.

(v) $ACD \rightarrow E$ holds in $S(A, C, D, E)$

(vi) There are no subsets of five out of the six attributes such that it is in BCNF.

(vii) $R_1(A, B, C)$ $R_2(C, E, F)$ $R_3(A, D, F)$
 $AC \rightarrow B$ $F \rightarrow CE$

(a) Since C is not the candidate key in either R_1 or R_2 the decomposition is not lossless.

(b) The dependency $BD \rightarrow F$ is not preserved.

(c) Since AC & F are the candidate keys in their respective tables the decomposition is in BCNF.

3.

(1) $\langle T_3, X, 10 \rangle$

$\langle T_2, X, 100 \rangle$

(2) Since T_2 was committed the following is true
After a successful recovery, the state of X is 10.

4.

A transaction is an action or a series of action that are being performed by a single user or application program, which reads or updates the contents of the database.

A transaction can be defined as a logical unit of work on the database.

PROPERTIES OF TRANSACTION

Any transaction must maintain the ACID properties.

- Atomicity - All actions in the transaction happen or none happen. "All or Nothing"
- Consistency - If each transaction is consistent and the DB starts consistent, then it ends up consistent. "It looks correct"
- Isolation - Execution of one transaction is isolated from that of other transactions. "as if alone"
- Durability - If a transaction commits, its effects persists. "survive failures"

5.

3NF VS BCNF

If 'R' is in BCNF, it is always in 3NF.
But the reverse is not true.

For $A \rightarrow B$

- 3NF

If B is a primary key attribute and A is not a candidate key.

- BCNF

A must be a candidate key.

3NF

- No non-prime attribute must be transitively dependent on the candidate key

- 3NF can be obtained without sacrificing all dependencies.

- Lossless decomposition can be achieved in 3NF.

BCNF

- For any trivial dependency in a relation R say $x \rightarrow y$, X should be a super key of R

- BCNF may not preserve all dependencies.

- Lossless decomposition is hard to achieve in BCNF.