AIMAN SIDDIQUA - 2K18/MC/008

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 3 NF.

- 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:

R(ABCD)

$R_1(ABD)$ $R_2(BC)$

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 → CE, F is not a candidate key & E is a non-prime attribute

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

(v) ACD → 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 → B F → 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 → F is not preserved.

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

3. (1) $<T_3, X, 10>$
$<T_1, X, 100>$

(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 TRASNSACTION

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	BCNF
• No non-prime attribute must be transitively dependent on the candidate key	• For any trivial dependency in a relation R say $X \rightarrow Y$, X should be a super key of R
• 3NF can be obtained without sacrificing all dependencies.	• BCNF may not preserve all dependencies.
• Lossless decomposition can be achieved in 3NF.	• Lossless decomposition is hard to achieve in BCNF.