SOMAIYA VIDYAVIHAR UNIVERSITY

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~~Experiment~~ / assignment / ~~tutorial No.~~ IA2
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DBMS : IA2

Q.1. Consider relation R with five attributes ABCDE. The dependencies are $A \longrightarrow B$, $BC \longrightarrow E$ and $ED \longrightarrow A$.
a). List all the keys for R.
b). Is R in 3NF?
c). Is R in BCNF?

Q.2. Suppose you are given relation with four attributes ABCD. The dependencies are,
a). $C \longrightarrow D$, $C \longrightarrow A$, $B \longrightarrow C$
b). $B \longrightarrow C$, $D \longrightarrow A$
c). $ABC \longrightarrow D$, $D \longrightarrow A$.

Find all candidate keys for each subquestion & identify the best normal form & why.

Q.1. ABCDE :
$A \longrightarrow B$
$BC \longrightarrow E$
$ED \longrightarrow A$

a). Since all RHS does not have CD,
So, $(CD)^+ = CD$.

Now, for combination of 3-length,
$(ABE\ ACD)^+ = ABCDE$
$(BCD)^+ = ABCDE$
$(ECD)^+ = ABCDE$

The lowest number of attributes required to get the complete relation is 3.

∴ The keys are ACD, BCD, ECD.

b). $A \rightarrow B$, $BC \rightarrow E$, $CD \rightarrow A$

In the RHS of dependencies, B, E, A, all attributes are prime attributes.

∴ They are all part of key.

Hence, relation R is 3NF.

c). Here,

$\underline{A} \rightarrow B$, $\underline{BC} \rightarrow E$, $\underline{ED} \rightarrow A$

NOT SUPERKEY

∴ Even 1 FD is violated, it will not be considered to be BCNF.

Hence, relation is not BCNF.

Q.2. a). $C \rightarrow D$, $C \rightarrow A$, $D \rightarrow C$

Here, candidate key is B.

R is in 2NF, however,

$(ABCD)^+ = ABCD$

$(ABC)^+ = ABCD$

$(AB)^+ = ABCD$

$(B^*)^+ = ABCD$

∴ The candidate key for this dependency is B.

∴ The non prime attributes (D, A) are functionally dependent (through C) on the prime candidate key (B). The following is in 2NF.

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b). $B \rightarrow C$, $D \rightarrow A$

$(ABCD)^+ = ABCD$
$(BCD)^+ = ABCD$
$(BD)^+ = ABCD$

∴ The primary key is BD.

∴ R is in 1NF form, since each attribute has only one dependency, i.e., relation contains an atomic value since, the non-prime attributes are not functionally dependent, candidate key is <u>not</u> 2NF, similarly for 3NF.

c). $ABC \rightarrow D$, $D \rightarrow A$

$(ABCD)^+ = ABCD$
$(ABC)^+ = ABCD$
$(BCD)^+ = ABCD$.

For BCD, non-prime attribute A is functionally dependent (through D) on candidate key BCD. The following is in 2NF form.

Since, there is no transitive partial dependency & is in 2NF form, the following relation R is in 3NF.

Since, there are more than one candidate keys, the following is not in BCNF.