DBMS
Assignment-2

MANJIT SINGH DUHAN
Admission No - 11TP001316
Roll No:- 2303res134
email:- duhan.manjit@gmail.com
manjit_2303res134@iitp.ac.in

P5. $r(A,B,C,D)$ is a relation with F.D: $(A \to B, B \to D)$. Find lossless join dependancy preserving BCNF.

The given relation is $r(A,B,C,D)$ and the Functional Dependency (FD) is $A \to B$, $B \to CD$.

To find out the lossless join & dependency preserving BCNF for the given relation, the following 3 steps can be followed.

Step 1: Check candidate key :- Candidate Keys are minimal Superkeys. To find them, we need to check if removing any attribute from the superkey makes it lose the ability to uniquely identify tuples.

① $\Rightarrow$ $\{A\}$ is a candidate key because removing any attribute from it will make it to lose its uniqueness property.

② $\Rightarrow$ $\{B\}$ B is also a candidate key due to same reason mentioned above.

Step 2: Check for BCNF violation!- To ensure the relation is in BCNF we need to check if it satisfies the BCNF condition. A relation is in BCNF if for every non-trival functional dependency $X \to Y$, X is a superkey. In our cas, both FD are non-trivial

Step 3 :- Lossless Join!- To ensure that the decomposition is lossless, we need to check if the intersection of the of attribute of the new relation $R_1(A,B)$ with FD $A \to B$ & $R_2(B,C,D)$ with FD $B \to CD$, it contains the superkey of either of the relation. In our case, it contains the attribute B, which is superkey, So this decomposition is lossles.

Dependency Preservence!- If each FD from the orignal relation can be drived from the FD of the new relation, then the decomposition preserves the dependency.

So, we can conclude that the decomposition is a jobless join, in BCNF, and dependency preserving BCNF decomposition.

P.6. $R(A, B, C, D)$ is a relation with FD $(A \to BC)$. Find lossless join, dependency preserving BCNF.

Ans As from FD $(A \to BC)$, A can determin both B & C attributes. So, we can say A is candidate key.

A relation is BCNF, if for every non-trival depency $X \to Y$, X is a super key. for the given FD $A \to BC$ it is non-trivial here A, is candidate as well as super key. So, there is no violation of BCNF.

P7. Student (name, c.no, roll, grade),

FD : name → CNo → grade
name → roll
roll → name.

Candidate key = { name, CNo
CNo, roll }

Prime attribute = Name, CNo, roll
Non-Prime attribute = grade.

Is it BCNF : $X \to Y$, where X is candidate key

name, CNo → grade → already BCNF
roll, CNo → grade → already BCNF
name → roll → Not BCNF
roll → name → Not BCNF

check for 3NF :

name → roll
roll → name

Both name, roll are the Prime attribute

So, relation is in 3NF, which is the higest form.

P8. R(A,B,C,D) is a relation with FD (AB→C, C→AD)
Find lossless join, dependency preserving BCNF.

From AB→C here AB is the Super Key
C→AD here C is the super key
So, AB & C both are Super Key, they are the candidate Key also.

AB^+ = ABCD (it can determine all attributes)
C^+ = ADC (it can not determine B so can not be a candidate key.

check for BCNF:

X→Y where X is a candidate Key

AB→C AB is a candidate Key
C→AD C is not a candidate key so it does not meet BCNF requirement.

To make it BCNF we need to perform decomposition.
So,
1. Create a new relational dependency R1(C, AD)
2. Remove the functional dependency FD(C→AD) from the original relation.
3. Now, the new relation will be
R(A,B,C) → New original relation
R1(C, AD) – New decomposed relation