Name: **Date: April 20, 2017**

CS281 - SPRING 2017

QUIZ 5

You are given the relation R(A, B, C, D) with the following set of FDs.

F= { A --> BC, C--> D, A --> D}

a. Obtain the 3NF decomposition for R.

b. Is the resultant decomposition in BCNF?

SOLUTION

a. 3NF decomposition.

Step 1: Find the minimal cover, U, for F.

a. Make RHS one attribute

   A --> BC becomes A --> B, A --> C

b. Eliminate redundant attributes from LHS: if LHS contains more than one attribute check if any of the LHS attributes can be eliminated.

   A --> B, A --> C, C--> D, A --> D

   There is no such FD.

c. Eliminate redundant FDs.

   Eliminate A --> D, since it is implied by A --> C, C --> C, C--> D

   Minimal cover U= { A --> B, A --> C, C--> D }

Step 2: Partition U into sets U_1, U_2, ... U_n

such that LHS of all elements of U_i are the same.

U_1= { A --> B, A --> C }

U_2= { C --> D }

Step 3: For each U_i form a relation R_i

R_1(A, B, C) , R_2(C, D)

Step 4: If no R_i contains a super key of the original relation R add scheme R_0 where attributes included in R_0 contains a super key of R.

A^+= ABCD is the super key of R so we are done.

b. Is the resultant decomposition in BCNF?

R_1(A, B, C) , R_2(C, D)

In R_1 we have A --> B, A --> C and A is a superkey of R_1

In R_2 we have C --> D and C is a superkey of R_2

In all FDs the LHS is the superkey of **that** relation that contains the FD so all relations are in BCNF and therefore the entire decomposition is in BCNF.

Additional Note: Note that we have a lossless join decomposition since the common attribute of R_1 and R_2, the attribute C, is a key of R_2.