

## CS1555 Recitation 4

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Objective: to practice normalization, canonical forms, decomposing relations into BCNF and checking for lossless decompositions.

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**Part 1:** For each of the following relations R and sets of functional dependencies F, do the following:

- 1) Find the canonical cover (minimal cover) of F.
- 2) Using the canonical cover, find the keys of the R.

1. Consider the following set of functional dependencies F on a relation R (A, B, C, D, E):

$A \rightarrow BC$   
 $A \rightarrow D$   
 $B \rightarrow C$   
 $C \rightarrow D$   
 $DE \rightarrow C$   
 $BC \rightarrow D$

2. Consider the following set of functional dependencies F on relation R (A, B, C, D, E, H):

$A \rightarrow C$   
 $AC \rightarrow D$   
 $E \rightarrow AD$   
 $E \rightarrow H$   
 $A \rightarrow CD$   
 $E \rightarrow AH$

**Part 2:** Consider the following set of functional dependencies F on relation R (A, B, C, D, E, H):

$A \rightarrow C$   
 $AC \rightarrow D$   
 $E \rightarrow AD$   
 $E \rightarrow H$   
 $A \rightarrow CD$   
 $E \rightarrow AH$

The key for R is *EB* and the following set of functional dependencies constitutes the canonical cover:

$A \rightarrow C, E \rightarrow A, E \rightarrow H, A \rightarrow D$

- 1) Using Synthesis, construct a set of 3NF relations.
- 2) Apply the decomposition method on R to end up with BCNF relations.

**Part 3:** Assume that R is decomposed into:

R1 (A, B), F1 = { $A \rightarrow B$ }, key (A)

R2 (B, C), F2 = { $B \rightarrow C$ }, key (B)

R3 (C, D, E), F3 = { $C \rightarrow D, DE \rightarrow C$ }, key (DE), (CE)

Is this decomposition a lossless-join decomposition? Use the table method.