

## CS1555 Recitation 11

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

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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:**

1. 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 Method, construct a set of 3NF relations.
- 2) Using Universal Method, decompose  $R$  into a set of BCNF relations.

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

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

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

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

- 1) Using Synthesis Method, construct a set of 3NF relations.
- 2) Using Universal Method, decompose  $R$  into a set of BCNF relations.

## **Part 3:**

Assume that  $R$  is decomposed into:

$R_1 (A, B), F_1 = \{A \rightarrow B\}$   
 $R_2 (B, C), F_2 = \{B \rightarrow C\}$   
 $R_3 (C, D, E), F_3 = \{C \rightarrow D, DE \rightarrow C\}$

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