Homework #4

Databases and File Structures

Illya Starikov, Jason Young, Claire Trebing

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1 Closures, Candidate Keys

- $A^+ = \{A\}$
- $AB^+ = \{A, B, C, D, E\}$ **Candidate Key**
- $AC^+ = \{A, B, D, C, E\}$ **Candidate Key**
- $ACD^+ = \{A, B, C, D, E\}$ **Candidate Key**
- $B^+ = \{B, D\}$
- $BC^+ = \{A, B, C, D, E\}$ **Candidate Key**
- $C^+ = \{C\}$
- $CD^+ = \{A, B, C, D, E\}$ **Candidate Key**
- $E^+ = \{A, B, C, D, E\}$ **Candidate Key**
- $DE^+ = \{A, B, C, D, E\}$ **Candidate Key**

2 Functional Dependence Equivalence

No, because there is no occurrence of $C \to D$ in G, but there is one in F.

3 Minimal Cover

Step 1

- $A \to B, A \to C, A \to D$
- $E \to G, E \to H$
- $C \to D$
- $AE \to J$

Step 2

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

- $E \rightarrow G, E \rightarrow H$

- $C \rightarrow D$

- $AE \rightarrow J$

Step 3

- $A \rightarrow B, A \rightarrow C$

- $E \rightarrow G, E \rightarrow H$

- $C \rightarrow D$

- $AE \rightarrow J$

4 3NF and BCNF

1. $F = \{AB \rightarrow C, C \rightarrow D, C \rightarrow A\}$, *Candidate Keys*: $(AB), (BC)$
    - No, because the in the functional dependency $C \rightarrow D$, D is not a part of any candidate key and A is not a super key.
    - No, because $\{C \rightarrow D\}$ is neither trivial nor a superkey.

2. $F = ACE \rightarrow BD, B \rightarrow C$, *Candidate Key*: (ACE)
    - Yes, because ACE is a super key and C is part of the candidate key.
    - No, because $\{B \rightarrow C\}$ is neither trivial nor a superkey.