

Armstrong's Axioms and rules for splitting and combining.

$$X \subseteq Y \Rightarrow Y \rightarrow X \quad (\text{Reflexivity})$$

$$X \rightarrow Y \Rightarrow XZ \rightarrow YZ \quad \forall Z \quad (\text{Augmentation})$$

$$X \rightarrow Y \wedge Y \rightarrow Z \Rightarrow X \rightarrow Z \quad (\text{Transitivity})$$

$$X \rightarrow Y \wedge X \rightarrow Z \Rightarrow X \rightarrow YZ \quad (\text{Combining})$$

$$X \rightarrow YZ \Rightarrow X \rightarrow Y \wedge X \rightarrow Z \quad (\text{Splitting})$$

Consider the relation $R(A, B, C, D)$. For each of the following sets of FDs,

- (1) $C \rightarrow D, C \rightarrow A, B \rightarrow C$
- (2) $B \rightarrow C, D \rightarrow A$
- (3) $ABC \rightarrow D, D \rightarrow A$
- (4) $A \rightarrow B, BC \rightarrow D, A \rightarrow C$
- (5) $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$

assuming those are the only dependencies that hold for R , do the following:

- (a) Identify the candidate key(s) for R .
- (b) Identify the best normal form (3NF or BCNF) that R satisfies.
- (c) If R is not in BCNF, decompose it into a set of BCNF relations.