Introduction to Databases
Tutorial 5

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Problem 1 (mandatory). Consider the following set of FDs:

$$D \to AC\,, \qquad\qquad AB \to DE\,, \qquad\qquad FD \to E\,, \qquad\qquad C \to F$$

(a) Indicate which of the above FDs hold in the following relation:

A	B	C	D	E	F
1	1	2	3	0	4
2	1	2	3	1	4
1	1	3	3	0	5

Moreover, for each FD that does not hold provide two tuples (from the above relation) constituting a violation.

(b) Determine whether each of the following FDs is implied by the FDs above:

$$AC \to E \qquad\qquad BD \to EF \qquad\qquad EF \to BC \qquad\qquad BC \to BF$$
$$AD \to CF \qquad\qquad ABC \to DF \qquad\qquad DEF \to AB \qquad\qquad DF \to AE$$
$$CD \to DE \qquad\qquad BE \to AC \qquad\qquad CD \to ED \qquad\qquad DE \to AF$$

(c) For each FD in point (b) that is implied, write a derivation using Armstrong's axioms (including union and decomposition). **Requirement for tutorial marks:** attempt at least one derivation.

Problem 2 (optional). Let R, S and T be relations on attributes A, B, C. Given the following set of INDs:

$$R[A, B] \subseteq S[B, C] \qquad\qquad\qquad S[C, B] \subseteq T[C, A]$$

determine which of the following INDs are implied:

$$R[A] \subseteq T[A] \qquad\qquad R[B] \subseteq T[B] \qquad\qquad R[C] \subseteq T[C]$$
$$R[A] \subseteq T[B] \qquad\qquad R[B] \subseteq T[A] \qquad\qquad R[B] \subseteq T[C]$$
$$R[C] \subseteq T[B] \qquad\qquad R[A] \subseteq T[C] \qquad\qquad R[C] \subseteq T[A]$$