

**Homework Assignment 5**

(due on Tuesday November 18, 2003)

- Continue reading Chapter 7 of the *Database System Concepts* book and also read Chapter 2.
- Exercises 7.4 (list non-trivial dependencies only), 7.7, 7.11, 7.12, 7.15 (solve the first part only),
- Let  $R$  be a relation schema with attributes  $A, B, C, D, E$  and let  $r$  be the following instance of  $R$

$A$	$B$	$C$	$D$	$E$
$a_1$	$b_1$	$c_1$	$d_1$	$e_1$
$a_1$	$b_2$	$c_2$	$d_2$	$d_1$
$a_2$	$b_1$	$c_3$	$d_3$	$e_1$
$a_2$	$b_1$	$c_4$	$d_3$	$e_1$
$a_3$	$b_2$	$c_5$	$d_1$	$e_1$

Consider the following functional dependencies:

$$A \rightarrow D, AB \rightarrow D, C \rightarrow BDE, E \rightarrow A, B \rightarrow A.$$

Which of these dependencies does  $r$  satisfy? Explain why.

- Let  $R(A, B, C, D, E)$  be a relation schema with the indicated attributes and assume that the following dependencies hold:  $A \rightarrow B, BC \rightarrow E, ED \rightarrow A$ .

Find all candidate keys of this relational schema  $R$ .

- We say that two sets  $F$  and  $G$  of functional dependencies are *equivalent* if  $F^+ = G^+$ , i.e., if they imply exactly the same functional dependencies. Show that the sets

$$F = \{A \rightarrow B, B \rightarrow C, C \rightarrow A\}$$

and

$$G = \{A \rightarrow BC, B \rightarrow A, C \rightarrow A\}$$

are equivalent. *Note:* You may compute  $F^+$  and  $G^+$  if you want, but there are easier ways to show that  $F$  and  $G$  are equivalent, namely it suffices to show that  $F \subseteq G^+$  and  $G \subseteq F^+$  (why?)