

**Homework Assignment 4**(due on *Election Day* Tuesday November 5, 2002)

- Read Chapter 7 of the *Database System Concepts* book.
- Exercises 4.10 (b), 7.4 (list non-trivial dependencies only), 7.5, 7.7

**Problem 1:**

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.

**Problem 2:** Consider the following database schema with information about PCs and laptops:

PRODUCT(maker, model)

PC(model, speed, disk, price),

LAPTOP(model, speed, screen, price).

It is assumed that the attribute name “model” is a key for each of these relational schemas.

Write SQL expressions for the following queries:

1. Find the average speed of laptops costing more than \$2,000
2. Find the average price of all products (PCs and laptops) made by Dell.
3. Find for each manufacturer who sells PCs the average and maximum price of its PCs.
4. Find for each manufacturer who makes at least three different models of laptops the average screen size of its laptops.