Assignment 6 (Chapter7, part1)

7.1 Suppose that we decompose the schema *R* = (*A*, *B*, *C*, *D*, *E*) into

(*A*, *B*, *C*)

(*A*, *D*, *E*).

Show that this decomposition is a lossless decomposition if the following set *F* of functional dependencies holds:

*A* → *BC*

*CD* → *E*

*B* → *D*

*E* → *A*

**Solution: R\_1 = (A,B,C), R\_2 = (A,D,E), so R\_1 ∩ R\_2 = (A).**

**Because A → BC, we have trivially A → ABC.**

**Hence we have R\_1 ∩ R\_2 → R\_1, thus we have shown that R decomposed into R\_1 and R\_2 is a lossless decomposition.**

7.2 List all nontrivial functional dependencies satisfied by the relation of Figure 7.18.

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **C** |
| a1 | b1 | c1 |
| a1 | b1 | c2 |
| a2 | b1 | c1 |
| a2 | b1 | c3 |

**Figure 7.18** Relation of Exercise 7.2.

**Solution: Since there are only three attributes, we can check these function dependencies one by one.**

**Single: A → B，yes。**

**Aug：A→AB, AC→BC, AC→ABC,**

**A → C，no.**

**B→A，no。**

**B→C，no。**

**C→A，no。**

**C→B，yes。**

**Aug: AC→AB, C→BC, AC→ABC.**

**Now we conclude here:**

**F={A → B, A→AB,AC→ABC, C→BC, C→B,AC→AB,AC→BC}**

7.13 Show that the decomposition in Exercise 7.1 is not a dependency-preserving decomposition.

**Solution: R\_1 ∩ R\_2 = (A):**

**A→BC implies A→B and A→C，with B → D，implies A → D**

**A→D and A→BC implies A→BCD, implies A→CD, with CD→E we have A→E，and finally A→BCDE**

**But the last dependence of E→A couldn’t be checked unless computing *R1*  joins *R*2**

**So, it is not dependency preserving.**