

数据库系统概念

作业 #7

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问题 1

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:

$A \rightarrow BC$

$CD \rightarrow E$

$B \rightarrow D$

$E \rightarrow A$

解答

$\because R_1 \cap R_2 = A$

$A \rightarrow BC$

即 $R_1 \cap R_2 \rightarrow R_1$

\therefore 这是一个无损压缩

问题 2

7.2 List all nontrivial functional dependencies satisfied by the relation of Figure 7.17.

A	B	C
a_1	b_1	c_1
a_1	b_1	c_2
a_2	b_1	c_1
a_2	b_1	c_3

表 1: Relation for Problem 7.2

解答

$A \rightarrow B$

$C \rightarrow B$

$AC \rightarrow B$

问题 3

7.14 Show that there can be more than one canonical cover for a given set of functional dependencies, using the following set of dependencies:

$X \rightarrow YZ, Y \rightarrow XZ, \text{ and } Z \rightarrow XY$

解答

有两个正则覆盖:

$X \rightarrow Y, Y \rightarrow Z, Z \rightarrow X$

$X \rightarrow Z, Y \rightarrow X, Z \rightarrow Y$

问题 4

7.15 The algorithm to generate a canonical cover only removes one extraneous attribute at a time. Use the functional dependencies from Exercise 7.14 to show what can go wrong if two attributes inferred to be extraneous are deleted at once.

解答

在依赖关系 $X \rightarrow YZ$ 中, 可以判定 Y 是无关属性, Z 同样也是无关属性
但如果同时删除这两个属性, 将导致新的依赖集无法再推导出原始依赖 $X \rightarrow YZ$
正则覆盖算法采用逐步删除策略, 就是为了避免这种同步删除导致的语义丢失问题