Multivalued Dependencies Quiz

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Quiz due May 8, 2022 16:53 IST

Each multiple-choice quiz problem is based on a "root question," from which the system generates different correct and incorrect choices each time you take the quiz. Thus, you can test yourself on the same material multiple times. We strongly urge you to continue testing on each topic until you complete the quiz with a perfect score at least once. Simply click the "Reset" button at the bottom of the page for a new variant of the quiz.

After submitting your selections, the system will score your quiz, and for incorrect answers will provide an "explanation" (sometimes for correct ones too). These explanations should help you get the right answer the next time around. To prevent rapid-fire guessing, the system enforces a minimum of 10 minutes between each submission of solutions.

Q1

1/1 point (graded)

[Q1] Here is an instance of a relation R(A,B,C):

A	B	C
1	2	3
1	3	2
1	2	2
3	2	1
3	2	3

Which of the following multivalued dependencies does this instance of R **not** satisfy?

- (●) A ↠ B
- ( ) AB ↠ C
- ( ) AB ↠ A
- ( ) BC ↠ C

✔

Problem Explanation

An MVD that includes all attributes of a relation is a trival MVD, i.e., always satisfied. The only nontrivial MVDs satisfied by this instance of R are C ↠ A and C ↠ B. Notice the first and fifth tuples have the same values for C, but if we swap their A's or B's we get the same tuples. Likewise, the second and third tuples have the same values for C, but again swapping their A's or B's

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yields the same tuples. All other possible MVDs with one attribute on each side are not satisfied by this instance of R. (You may wish to review the formal definition of an MVD.)

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Answers are displayed within the problem

Q2

1/1 point (graded)

[Q2] Here is an instance of a relation R(A,B,C,D):

A	B	C	D
1	2	3	4
1	3	3	3
1	3	3	4
1	2	3	3
2	2	4	4
2	4	2	4
2	4	4	4
2	2	2	4

Which of the following multivalued dependencies does this instance of R satisfy?

- BD ↠ A
- AB ↠ C
- D ↠ A
- BD ↠ C

✔

Problem Explanation

Start with the given tuples. Try to apply the given MVD to any pair of tuples you can (i.e., any pair of tuples that have the same values for the attributes on the left side of the MVD). Each application of an MVD dictates two more tuples that must be in the relation: the tuples formed by swapping the values for the attributes on the right side of the MVD. (You may wish to review the formal definition of an MVD.) If either of these tuples is not in the relation, then the MVD is not satisfied.

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Answers are displayed within the problem

Q3

1/1 point (graded)

[Q3] Consider relation R(A,B,C,D,E) with multivalued dependencies:

$A \twoheadrightarrow B$, $B \twoheadrightarrow D$

Suppose R contains the tuples (0,1,2,3,4) and (0,5,6,7,8). Which of the following tuples must also be in R?

- (0,1,6,3,8)
- (0,1,2,7,8)
- (0,1,2,3,8)
- (0,5,2,3,8)

Problem Explanation

Applying $A \twoheadrightarrow B$ to the given tuples, we infer that (0,5,2,3,4) and (0,1,6,7,8) are in R. Applying $B \twoheadrightarrow D$ to (0,1,2,3,4) and (0,1,6,7,8), we infer that (0,1,2,7,4) and (0,1,6,3,8) are in R. Applying $B \twoheadrightarrow D$ to (0,5,6,7,8) and (0,5,2,3,4), we infer (0,5,6,3,8) and (0,5,2,7,4) are in R. At this point no more inferences can be made: If we take any two of the eight tuples we know to be in R, and we apply one of the two MVDs, we get only tuples we already know are in R.

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Answers are displayed within the problem

Q4

1/1 point (graded)

[Q4] Here is an instance of a relation R(A,B,C,D):

A	B	C	D
1	2	3	7
1	2	3	8
4	2	5	7
4	2	5	8

Consider the following three multivalued dependencies:

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(1) AB ↠ C, (2) CD ↠ A, (3) D ↠ C

The following (M,n) pairs say that to satisfy multivalued dependency M (M=1, M=2, or M=3), a minimum of n tuples must be added to the given instance of R. Only one such pair is correct; which one?

- ○ (1,1)
- ○ (2,2)
- ○ (3,3)
- ◉ (1,0)

‹ Previous Next ›

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