Functional 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] Consider relation R(A,B,C,D,E) with functional dependencies:

$AB \rightarrow C$, $C \rightarrow D$, $BD \rightarrow E$

Which of the following sets of attributes does **not** functionally determine E?

- BC
- C ✔
- AB
- BCD

Answer-Selection Feedback

Yes; $C^+ = CD$, so E is not functionally determined.

Problem Explanation

Let S be the set of FDs. To determine whether E is functionally determined by a given set of attributes, compute the closure of the set of attributes based on the FDs in S. Check if E is in the closure.

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Answers are displayed within the problem

Q2

1/1 point (graded)

[Q2] Consider relation R(A,B,C,D,E) with functional dependencies:

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D → C, CE → A, D → A, AE → D

Which of the following is a key?

- A
- BDE
- CDE
- BD

Answer-Selection Feedback
Yes; BDE^+= ABCDE.

Problem Explanation
A set of attributes A is a key for a relation R if A functionally determines all attributes in R. Given a set S of FDs, we compute the closure of attribute set A using the FDs in S, then check if the closure is the set of all attributes in R.

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Answers are displayed within the problem

Q3

1/1 point (graded)
[Q3] Let relation R(A,B,C,D,E,F,G,H) satisfy the following functional dependencies:

A → B, CH → A, B → E, BD → C, EG → H, DE → F

Which of the following FDs is also guaranteed to be satisfied by R?

- BDG → AE
- ACG → DH
- CDE → AF
- BFG → AE

Answer-Selection Feedback
Yes; BDG^+ = BDGECHAF (all attributes), which contains AE.

Problem Explanation
To determine if an FD F follows from a set S of FDs, compute the closure of the left side of F based on the FDs in S. If the right side of F is included in the result of the closure, then F follows from the FDs in S. If the right side of F contains any attributes not in the closure, then F does not follow from the FDs in S.

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Answers are displayed within the problem

Q4

1/1 point (graded)

[Q4] Consider relation R(A,B,C,D,E,F) with functional dependencies:

CDE $\rightarrow$ B, ACD $\rightarrow$ F, BEF $\rightarrow$ C, B $\rightarrow$ D

Which of the following is a key?

- ABE
- ABDF
- ADEF
- ACDE ✔

Answer-Selection Feedback

Yes; $ACDE^+$ = all attributes.

Problem Explanation

A set of attributes A is a key for a relation R if A functionally determines all attributes in R. Given a set S of FDs, we compute the closure of attribute set A using the FDs in S, then check if the closure is the set of all attributes in R.

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Answers are displayed within the problem

Q5

1/1 point (graded)

[Q5] Consider relation R(A,B,C,D,E,F,G) with functional dependencies:

AB $\rightarrow$ C, CD $\rightarrow$ E, EF $\rightarrow$ G, FG $\rightarrow$ E, DE $\rightarrow$ C, and BC $\rightarrow$ A

Which of the following is a key?

- ADFG
- BDEG
- BCDE
- BDFG

Hide Notes

Answer-Selection Feedback
Yes; $BDFG^+$ = ABCDEFG.

Problem Explanation
A set of attributes A is a key for a relation R if A functionally determines all attributes in R. Given a set S of FDs, we compute the closure of attribute set A using the FDs in S, then check if the closure is the set of all attributes in R.

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Answers are displayed within the problem

Q6

1/1 point (graded)
[Q6] Let relation R(A,B,C,D,E) satisfy the following functional dependencies:

$AB \rightarrow C$, $BC \rightarrow D$, $CD \rightarrow E$, $DE \rightarrow A$, $AE \rightarrow B$

Which of the following FDs is also guaranteed to be satisfied by R?

- $BD \rightarrow E$
- $C \rightarrow E$
- **$CD \rightarrow B$** ✓
- $AD \rightarrow B$

Answer-Selection Feedback
Yes; CD^+ = ABCDE, which contains B.

Problem Explanation
To determine if an FD F follows from a set S of FDs, compute the closure of the left side of F based on the FDs in S. If the right side of F is included in the result of the closure, then F follows from the FDs in S. If the right side of F contains any attributes not in the closure, then F does not follow from the FDs in S.

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Answers are displayed within the problem

Q7

1/1 point (graded)
[Q7] Let relation R(A,B,C,D) satisfy the following functional dependencies:

$A \rightarrow B$, $B \rightarrow C$, $C \rightarrow A$

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Call this set S1. A different set S2 of functional dependencies is *equivalent* to S1 if exactly the same FDs follow from S1 and S2. Which of the following sets of FDs is equivalent to the set above?

- ○ A → B, B → C, C → B
- ○ A → B, B → A, C → A
- ◉ A → BC, B → AC, C → AB
- ○ A → BC, B → AC

✔

Problem Explanation
The given set of FDs has the property that any single attribute determines all of the other attributes, and consequently any subset of the attributes determines any other subset. Any equivalent set of FDs must have this same property.

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ℹ Answers are displayed within the problem

Q8

1/1 point (graded)
[Q8] Suppose relation R(A,B,C) currently has only the tuple (0,0,0), and it must always satisfy the functional dependencies A → B and B → C. Which of the following tuples may be inserted into R legally?

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

✔

Problem Explanation
To avoid violating A → B, the new tuple either has to disagree with

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