

# Quiz09 Solutions

## FD Properties

1. Select all the FD's that follow from Armstrong's Axioms \*

if  $X \rightarrow Y$  and  $Z \rightarrow W$ , then  $XZ \rightarrow YW$

if  $X \rightarrow Y$  and  $WY \rightarrow Z$ , then  $WX \rightarrow Z$

if  $XZ \rightarrow Y$ , then  $X \rightarrow Y$  (Incorrect)

if  $X \rightarrow YZ$ , then  $X \rightarrow Y$

if  $X \rightarrow Y$  and  $X \rightarrow Z$ , then  $X \rightarrow YZ$

## FD Example

We have a relation  $R(A, B, C, D, E)$ . We are told that the set of functional dependencies is

$F = \{E \rightarrow BD, A \rightarrow BC, C \rightarrow DE, D \rightarrow C\}$ .

Find the attribute closures for each of the attributes. If the attribute closure for  $X$  was  $WXZ$ , you would fill in "WXZ" without quotes in the answer box.

2.  $A^+$ : ABCDE

3.  $B^+$ : B

4.  $C^+$ : CDE

5.  $D^+$ : CD

6.  $E^+$ : BCDE

7. Select the attribute set(s) that are keys for relation  $R$  \*

- E (Incorrect)
- A
- AD
- BCE (Incorrect)
- ABCDE

8. The attribute closure of  $(BC)^+$  is equivalent to the attribute closure of  $(BD)^+$ . \*

**False.**

9. Is relation  $R$  already in Boyce-Codd Normal Form (BCNF)? \*

**No. – There are some trivial FDs.**

## Normalization

Assume the decomposition is performed using the algorithm described in lecture.

10. Putting a relation in Boyce-Codd Normal Form (BCNF) will always guarantee a lossless decomposition.

**False**

11. Putting a relation in Boyce-Codd Normal Form will always guarantee a dependency preserving decomposition.

**False**

12. Determine whether the decomposition is lossless or not.

If relation  $R(A, B, C, D, E)$  is decomposed into  $R(A, C, D)$  and  $R(A, B, C, E)$  with the set of functional dependencies  $F = \{BC \rightarrow A, C \rightarrow D\}$ . Note: the decomposition might not follow the BCNF algorithm discussed in class.

**No.**

We see that  $R_1 \cap R_2$  is  $AC$ . Since, since the FD  $AC \rightarrow ACD$  is not a key of either resulting relation, then the decomposition is not lossless.