

COSC 4820, Spring 2023
Homework 4, BCNF

Question 1: [10 points]

Consider a relation with schema $R(A, B, C, D, E)$ and FD's

$$\begin{aligned} AB &\rightarrow DE \\ C &\rightarrow E \\ D &\rightarrow C \\ E &\rightarrow A. \end{aligned}$$

We wish to project these FD's onto the relation $S(A, B, C)$. Give the FD's that hold in S .

Question 2: [30 points]

For these two relation schema and sets of FD's

(A)	$R(A, B, C, D)$	(B)	$R(A, B, C, D)$
	$AB \rightarrow C$		$AB \rightarrow C$
	$C \rightarrow D$		$BC \rightarrow D$
	$D \rightarrow A$		$CD \rightarrow A$
			$AD \rightarrow B$

do the following:

- (a) (5 points) For (A), indicate all the BCNF violations. Do not forget to consider FD's that are not in the given set, but follow from them. However, is it not necessary to give violations that have more than one attribute on the right side.
- (b) (5 points) Do the same for (B).
- (c) (10 points) Decompose relation (A), as necessary, into collections of relations that are in BCNF.
- (d) (10 points) Do the same for relation (B).

Question 3: [10 points]

In section 3.3.4 it was mentioned that we would expand the right side of an FD that is a BCNF violation if possible.

Consider relation $R(A, B, C, D)$ with FD's $A \rightarrow B$ and $A \rightarrow C$. Either is a BCNF violation, because the only key for R is $\{A, D\}$. Suppose we begin by decomposing R according to $A \rightarrow B$. Do we ultimately get the same result as if we first expand the BCNF violation to $A \rightarrow BC$? Why or why not.