

Homework assignment 4 (15 points)

1. (5 points)

Given a relation $R(V, W, X, Y, Z)$ and the following dependencies: $V \rightarrow W$ $WX \rightarrow Z$, and $ZY \rightarrow V$.a. List all keys for R . **$(V, X, Y), (W, X, Y), (X, Y, Z)$** b. Is R in 3NF?**Yes**c. Is R in BCNF?**No**

2. (5 points)

Suppose you are given a relation R with four attributes, A, B, C, D and given FDs set as: $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$ Assuming these are the only dependencies that hold in R , do the following:(a) Identify the candidate key(s) for R . **$(AB), (B, C), (A, D), (C, D)$** (b) Identify all the normal forms that R satisfied (1NF, 2NF, 3NF, or BCNF).**1NF, 2NF, 3NF**(c) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies. **$\{(CD), (AC), (BD)\}$**

3. (5 points)

Suppose you are given a relation $R(A, B, C, D)$. For each of the following sets of FDs (labelled as (i), (ii), (iii) below), assuming they are the only dependencies that hold in R , do the following:(a) Identify the candidate key(s) in R .(b) State whether the proposed decomposition of R is good or not, and briefly explain why or why not.i. $B \rightarrow C, D \rightarrow A$; decompose into BC and AD .**Candidate Keys: (B, D)** **The decomposition is not good but we are still missing the relation BD when decomposing. Therefore this is a *lossy* decomposition.**ii. $AB \rightarrow C, C \rightarrow A, C \rightarrow D$; decompose into ACD and BC .**Candidate Keys: $\{(A, B), (B, C)\}$**

**The decomposition is not good because it is the incorrect decomposition.
The correct decomposition to 2NF is CD and ABC.**

iii. $A \rightarrow BC, C \rightarrow AD$; decompose into ABC and AD .

Candidate Keys: (A, C)

The decomposition is good because the following functional dependencies are already in BCNF