

Database Systems, CSCI 4380-01

Homework # 2

Due Thursday September 19, 2019 at 11:59:59 PM

Homework Statement. This homework is worth 2.5% of your total grade. If you choose to skip it, Midterm #1 will be worth 2.5 % more. Remember, practice is extremely important to do well in this class. I recommend that not only you solve this homework, but also work on homeworks from past semesters. Link to those is provided in the Piazza resources page.

This homework is for practicing Normalization.

Question 1. Given the following set of functional dependencies, convert it to a minimal basis. Show the main steps, list the changes and explain why the change was made.

$$\mathcal{F} = \{BCF \rightarrow CE, AD \rightarrow EF, BC \rightarrow AF, ACD \rightarrow DF\}$$

Question 2. You are given the relation $R(A, B, C, D, E, F, G, H)$ with the set \mathcal{F} of functional dependencies: $\mathcal{F} = \{AB \rightarrow CD, BD \rightarrow EF, AD \rightarrow G, F \rightarrow B\}$.

Given the decomposition: $R1(A, F, H), R2(A, B, C, D), R3(B, D, E, F), R4(A, D, G)$, check if the decomposition is lossless or not using the Chase algorithm. Show the crucial steps and discuss whether it is lossy or lossless.

Question 3. You are given the following relations and set of functional dependencies. For each relation, (i) list the keys, (ii) check if relation is in BCNF or not, (iii) check if the relation is in 3NF or not. Explain your reasoning.

(a) $R1(A, B, C, D, E), \mathcal{F}_1 = \{AB \rightarrow CD, ABC \rightarrow E\}$

(b) $R2(A, B, C, D, E), \mathcal{F}_2 = \{AB \rightarrow CD, BC \rightarrow E\}$

(c) $R3(A, B, C, D, E), \mathcal{F}_3 = \{AB \rightarrow CD, ABC \rightarrow E, ED \rightarrow A\}$

SUBMISSION INSTRUCTIONS. Submit a PDF document for this homework using Gradescope. No other format and no hand written homeworks please. No late submissions will be allowed.