**Database Management Systems**

**Assignment 2**

Yongsung Cho

Kingsely chuckwu

Oregon State University

CS 540: Database Management Systems

Prof. Arash Termehchy

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**Assignment 2**

1. **BCNF and 3NF**

Consider a relation R with five attributes A, B, C, D, and E. You are given the following functional dependencies: A → B, BC→E, and ED→A.

1. List all keys for R. (0.5 point)

(b) Is R in BCNF? If it is not, decompose it into a collection of BCNF relations. (0.5 point)

#1 / key (C,D,E)

#2 / key (A,C,D)

#3 / key (B,C,D)

1. Is R in 3NF? If it is not, convert it into a collection of 3NF relations. (0.5 point)
2. **BCNF and 3NF**

Consider the relation schema R with attributes A, B, C, and D and the following functional dependencies: AB→C, AC→B, B→D, BC→A.

1. List all keys for R. (0.5 point)
2. Is R in BCNF? If it is not, decompose it into a collection of BCNF relations. (0.5 point)

Not sure. I have to think more.

#1

#2

#3

1. Is R in 3NF? If it is not, convert it into a collection of 3NF relations. (0.5 point)

R is in 3NF

1. **FD Implication & Schema Decomposition**
2. Given that X, Y, W, Z are attributes in a relation, using Armstrong’s axioms, prove that if we have X→Y and YW→Z, then XW→Z.(0.25point)
3. Given that X,Y,Z are attributes in a relation, using Armstrong’s axioms, prove that if we haveX→Y andX→Z,thenX→YZ. (0.25point)

(c) Prove that, if relation R has only one simple key, it is in BCNF if and only if it is in 3NF. (0.5 point)

1. **Information preservation**
2. Suppose you are given a relation R(A,B,C,D) with functional dependencies B→C and D→A. State whether the decomposition of R to S1(B,C) and S2(A,D) is lossless or dependency preserving and briefly explain why or why not. (0.5 point)

Lossless

If R is divided 2 Relation, S1,S2 doesn’t express their connection

If you want to divide S1 and S2, you should add Relation S3 about connection.

(b) Prove that the 3NF synthesis algorithm produces a lossless-join decomposition of the relation containing all the original attributes. (0.5 point)

**References**