CS4.301: Data and Applications **Due: 11:55PM, 25^{th} September 2020**

Group Assignment #4

Instructor: Kamal Karlapalem *Released:* 24^{th} September 2020

1 The Task

For Group Assignment 4, you have to solve the given questions on normalization. The goal of this assignment is to familiarize you with the dependency notations and understand the four normal forms.

2 Questions

2.1 Part One

Consider $R(A_1, A_2, ..., A_n)$ to be a relation with functional dependencies defined as follows:

$$A_1 \rightarrow A_2\ A_3...A_n\ (i = 1)$$

$$A_2\ A_3 \rightarrow A_4\ A_5...A_n\ A_1\ (i = 2)$$

$$A_4\ A_5\ A_6 \rightarrow A_7\ A_8...A_n\ A_1\ A_2\ A_3\ (i = 3)$$

Functional dependencies of the sequence,

$$A_{\frac{(i-1)(i)}{2}+1}\ A_{\frac{(i-1)(i)}{2}+2}...\ A_{\frac{(i-1)(i)}{2}+i} \rightarrow A_{\frac{(i-1)(i)}{2}+i+1}...\ A_n\ A_1...A_{\frac{(i-1)(i)}{2}}$$

for $i > 3$ and till

$$\frac{(i-1)(i)}{2} + i = n$$

2. For what values of n is the above set of functional dependencies possible.

3. How many keys does the relation R have and what are they?

4. State the normal form of the above relation and normalize it to $BCNF$ (if valid) using decomposition rules.

5. Find the minimal cover of the above relation and use it to normalize it to $BCNF$ (if valid).

2.2 Part Two

Consider $R(A_1, A_2, ...A_n)$ be a relation R with functional dependencies as follows:

$$A_i \rightarrow A_j\ for\ all\ 1 \leq i < j \leq n$$

and

$$A_i \rightarrow A_j \; for \; all \; 1 \leq i > j \leq n$$

1. How many keys does the relation R have and what are they?

2. State the normal form of the above relation and normalize it to $BCNF$ (if valid) using decomposition rules.

3. Find the minimal cover of the above relation and use it to normalize it to $BCNF$ (if valid).

3 Submission Instructions

Submit a single PDF named <**teamname**>**.pdf** (without the < and >).

All the best!