**CS 4721 (Database Design I) [Spring 2019]**

**Assignment – Functional Dependencies**

**Due date: 11:00 p.m., Monday, April 22, 2019**

**Question 1.** Consider a relation **R**(A, B, C, D, E) with the following functional dependency set **F** = {AB 🡪 C, CD 🡪 E, DE 🡪 B}

[*Read an f.d XY 🡪 Z as {X, Y} 🡪 {Z} where X, Y, and Z are atomic attributes.]*

Test whether AB is a candidate key of **R**. (Show your work). [6 pts]

ABf+ => {A, B, C}

Not a candidate key.

**Question 2.** Consider a relation **R**(A, B, C, D) with the functional dependencies {AB 🡪 C, C 🡪 D, D 🡪 A}. Does BC 🡪 A hold on R? Explain/Show the proof. [4 pts]

BCf+ =>{B, C, D, A}

BC 🡪 {A} Holds

**Question 3.** Consider the following relation:

**VISIT (Doctor#, Patient#, Date, Diagnosis, Treat-code, Charge)**

In this relation, a tuple (row) describes a visit of a patient to a doctor along with a treatment code and daily charge. Assume that diagnosis is determined (uniquely) for each patient by a doctor. Assume that each treatment code has a fixed charge (regardless of patient).

(i) What are the functional dependencies that can be inferred from the above? [5 pts]

Doctor#, Patient#, Date 🡪 Diagnosis

~~Diagnosis 🡪 Treat-code~~

Treat-code 🡪 Charge

(ii) Is the VISIT relation in 2NF? Justify your answer and decompose, if necessary. [5 pts]

Yes, the relations are based on the whole key.

**Question 4**. Consider the universal relation **R**(A, B, C, D, E, F, G). The following dependencies hold on **R**: {A 🡪 CDE, B 🡪 FG, AB 🡪 CDEFG}. **Find a *minimal cover* of the functional dependency set**. (*Note: If you end up with f.d.s like A 🡪 B, A 🡪 C, A 🡪 E, in the minimal cover, then you can combine them into single f.d. as A 🡪 BCE at the end. That is, after ending the algorithm and the result with you, it is okay to combine dependencies with same left-hand side after ending the algorithm.*) [10 pts]

A 🡪 C, D, E

B 🡪 F, G

**Submission guideline:** You have the following options to submit your assignment. Choose only one option that suits you best.

1. Submit a handwritten copy in class. Writing should be clear (readable). Include **Course number** (CS4721), **Semester** (Spring 2019), and **your name** at the top. Failure to include these will not be accepted.
2. Scan your handwritten copy (including information mentioned in (i)) and submit it through BlazeVIEW dropbox. Scan resolution should be good (readable).
3. Type your answers on a document file using MS-Word. Include all information (mentioned in (i)) and submit through BlazeVIEW dropbox. Make sure symbols are appearing appropriately.