CSC 355 Database Systems 501T-530
Winter 2023
Assignment 6 – Functional Dependencies

For each question, show your work. Points will be taken if the steps you take are not present as part of the solution. Please submit the solution in PDF or WORD.

A-1 Armstrong Axioms

a. Consider the relation R(L,M,N,O,P,Q) and a set of functional dependencies F = {LNO→M, MN→LOP, N→O, OP→LN}.
   - [2pt] Can we infer NP → LM from F ?
   - [3pt] Can we infer NQ → LO from F ?

b. Prove the derived decomposition and composition as we did for transitivity.
   - [5pt] Decomposition: If X→YZ then X→Y and X→Z
   - [5pt] Composition: If X→Y and Z→W then XZ→YW

c. [10 pt] Consider R (O,P,Q,R,S,T) to be a relation schema, and let F = {O → P, Q → O, PR → Q, RS → T} be a set of functional dependencies (FDs).
   - Infer at least five new FDs by using Armstrong's axioms and their derived inference rules. Use a different rule per answer

A-2 Keys

a. [5pt] Find **all** the candidate keys of the Relation R(ABCDE) with FD's: D → C, CE → A, D → A, and AE → D

b. [5pt] Determine **all** the candidate and super keys of the relation R(ABCDEF) with FD's: {AEF → C, BF → C, EF → D, ACDE → F}

c. [5pt] Consider the relation EMPLOYEE(ID, First, Last, Team, Dept, Salary) with the following set F of functional dependencies, Identify all the candidate keys of EMPLOYEE:

   ID →First
   ID → Last
   First, Last → ID
   Last → Team
   ID →Dept
   ID → Salary
   Salary → Dept

d. [10pt] Given R(I, N, C, S) and F {I→N, I→C, I→S, C→S}
   - [5pts] Calculate the closure of all possible subsets of attributes
   - [2pts] Identify all super keys
   - [3pts] Identify all candidate keys