This problem set is due at **11:55pm on Thursday, April 4, 2019**. Don’t go by the due date that you see on Blackboard because it is in EST. Go by the one given in this handout.

**Be sure to include** a comment at the top of each file submitted that gives your name and email address.

Submit your solution files on Blackboard. Multiple submissions are allowed before the due date.

**Problem 1**

On slide page 17 of Lec5_ER.pdf the first bullet point mentions that WorksIn4 does not allow an employee to work in a department for two or more periods. Show that is indeed the case.

**Problem 2**

How many distinct tuples are in a relation instance with cardinality 22?

**Problem 3**

Answer each of the following questions briefly. The questions are based on the following relation schema:

Emp(eid: integer, ename: string, age: integer, salary: real)
Works(eid: integer, did: integer, pct_time: integer)
Dept(did: integer, dname: string, budget: real, managerid: integer)

1. Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple?

2. Write the SQL statements required to create the preceding relations, including appropriate versions of all primary and foreign key integrity constraints.

3. Define the Dept relation in SQL so that every department is guaranteed to have a manager.

4. Write an SQL statement to add John Doe as an employee with $eid = 101, age = 32$ and $salary = 15,000$.

5. Write an SQL statement to give every employee a 10% raise.

6. Write an SQL statement to delete the Toy department. Given the referential integrity constraints you chose for this schema, explain what happens when this statement is executed.
Problem 4

Explain why the addition of NOT NULL constraints to the SQL definition of the Manages relation (in Section 3.5.3) would not enforce the constraint that each department must have a manager. What, if anything, is achieved by requiring that the ssn field of Manages be non-null?

Problem 5

Consider the scenario from Problem 1 that you did in the previous problem set, where you designed an ER diagram for a university database. Write SQL statements to create the corresponding relations and capture as many of the constraints as possible. If you cannot capture some constraints, explain why. Please use my sample solution for Problem 1 as the starting point as you solve this problem. It will make grading much easier for us. I will make my sample solution available soon.

Problem 6

Consider the scenario from Problem 2 that you did in the previous problem set, where you designed an ER diagram for a company database. Write SQL statements to create the corresponding relations and capture as many of the constraints as possible. If you cannot capture some constraints, explain why. Please use my sample solution for Problem 2 as the starting point as you solve this problem. It will make grading much easier for us.