Database Systems – Summer 2019

Week-5 Total: 100 Points

Q1. (30 points)

In assignment-3, you designed an ER diagram for the University database. Include that ER diagram in your solution for this assignment as well. Based on your ER and understanding of relational database, convert the University ER diagram to a database with required number of tables. Each table must be normalized to 3rd Normal Form. Include given (and assumed) functional dependencies (FD+) and closures (FD+) as well. Show the normalization steps from 1NF -> 3NF.

Solution must contain:

a. ER diagram
b. Tables normalized up to 3NF
c. FDs & FD+

Q2. (30 points)

In assignment-3, you designed an ER diagram for your favorite sport. Include that ER diagram in your solution for this assignment as well. Based on your ER and understanding of relational database, convert your favorite sport ER diagram to a database with required number of tables. Each table must be normalized to 3rd Normal Form. Include given (and assumed) functional dependencies (FD+) and closures (FD+) as well. Show the normalization steps from 1NF -> 3NF.

Solution must contain:

a. ER diagram
b. Tables normalized up to 3NF
c. FDs & FD+

Q3. (20 points)

Suppose a data file for Student (Name, SSN, Address, Phone, Email…). Given that the data file's record size is 400 bytes, disk block size is 1024 bytes, and total number of records are 3000000. For index entry, the field size is 9 bytes, and the pointer size is 8 bytes. Answer the following questions:

a. What will be the average linear search cost using data file?
b. What will be binary search cost using data file?

c. What will be binary search cost using index file (dense index)?

Discuss why using indexes is almost always better.

Q4. (20 points)

What are two major differences between B and B+ trees? Show step by step insertion in a B+ tree with the insertion sequence as: 7, 3, 12, 9, 8. Then, show how deletion would happen in the same B+ tree with the sequence as: 8, 3.