ITEC 3335
Database Development
Fall 2019
Homework #7

Logical Database Design and Normalization Theory

[1] The relation R(A,B,C,D) has two candidate keys: AB and CD. What are the superkeys?

[2] True or False. Prove your assertion.

(a) A relation R not in 3NF may be in 2NF.

(b) R(A,B,C,D) may have four candidate keys.

(c) A superkey of R may not be a candidate key of R.

[3] Consider the following table: Shipment.

Shipment(ShipmentId, SupperId, SupplerName, PartId, PartName, ShipmentDate, Quantity)

A row in the table stores information about a shipment of certain quantity of a part by a supplier on a shipmentDate. ShipmentId is a unique identifier of a shipment. Likewise, supplerId and partId are unique identifiers of a supplier and a part respectively. A supplier name is also unique but more than one parts may have the same part name. It is possible that the same supplier may ship the same part more than once in a specific date.

(a) Identify the functional dependencies (FD) of the relation.

(b) What are the candidate keys?

(c) What are the non-prime attributes?

(d) What is the highest normal form of the relation? Assume that it is in at least 1NF.

(e) If it is not in BCNF, decompose the relation to relations of BCNF or 3NF.

[4] Consider R(A,B,C,D) with {B->A, BA->C, C->D}

(a) Find A+, B+, C+ and D+.

(b) Find all candidate key(s).

(d) What is the highest normal form of R?

[5] Consider the following enrollment report of a tutoring service company.

Black and White Tutorial Service Company
9800 Bay Area Boulevard
Houston, TX 77000

Student Id: 1023102
Student Name: Jane Smith
Student's Phone: 281-783-1989
Student's Email: Not available

Class Report

Class	#1	#2	#3
ClassId	101	112	132
ClassName	SQL	Database	Zen Meditation
# Class Attended	3	2	6
Feed Class?	Yes	No	Yes
Class Fee	$30	N/A	$150

Total Class Fee: $180

...

(a) Design a *minimal* set of tables (and their columns) in at least 3NF to store this kind of invoice information.

(b) List the functional dependencies of each table.

(6) Hoffer, et al., Exercise 4-54, p200 to 202. (See Blackboard for more.) Make the changes in the tasks as below (italicized):

a. Identify the functional dependencies between the attributes. *If you have made a reasonable assumption in stating a functional dependency, state the assumption.*

b. Identify the *highest* normal form in which the relation currently is.

c. Identify the *potential* errors in the data that have been made possible by its poor structural characteristics.

d. *Decompose the table into tables of 3NF or above.*