**COP4710 – Theory and Structure of Databases**

**Summer 2016**

**Homework 8**

Due Sunday Night, July 3, 2016

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**1.** What is a multi-valued dependency? One sentence.

One instance of attribute A determines several instances of attribute B.

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2. The following table tells us about:

* Chinese take-out stores
* Menu items
* The stores’ delivery areas

**Store**

|  |  |  |
| --- | --- | --- |
| ***store*** | ***menuItem*** | ***deliveryArea*** |
| 01 | Generals Chicken | 3rd St. |
| 01 | Cashew Chicken | 5th St. |
| 01 | Mu Shu Pork | 6th St. |
| 01 | Chop Suey |  |
| 02 | Generals Chicken | 1st St. |
| 02 | Cashew Chicken | 2nd St. |
| 02 |  | 7th St. |
| 02 |  | 8th St. |
| 03 | Mu Shu Pork | 4th St. |
| 03 | Mu Shu Pork | 9th St. |

**(a)** Identify the dependencies in this table.

Hint:

A *functional (single valued) dependency* looks like this:

determinant → dependentAttributes

A *multivalued dependency* looks like this:

determinant →→ dependentAttributes

store →→ menuItem

store → → deliveryArea

**(b)** Decompose the table into Fourth Normal Form.

Menu (store, menuItem)

Delivery (store, deliveryArea(

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3. A vehicle is considered to be heavy if it's 5000 or more pounds, and light if it's below 2000 pounds, and Medium otherwise. The following table shows four vehicles:

**Vehicle**

|  |  |  |  |
| --- | --- | --- | --- |
| **make** | **model** | **type** | **weight** |
| Ford | F-350 | Heavy | 7000 |
| Mazda | Miata | Light | 1800 |
| Toyota | Camry | Medium | 3000 |
| Lincoln | Town Car | Heavy | 5100 |

There's a relationship between the “type” column and the “weight” column. The values in “type” are descriptions of Heavy, Medium, and Light. The values in “weight” also correspond to Heavy, Medium, and Light. These two columns are related to each other, and they shouldn't be.

The table complies with all the normal forms through 5NF, so there isn't a key problem. The problem stems from an interrelationship between the the domains of “type” and “weight”.

**(a)** What normal form does this table not comply with?

Domain/Key Normal Form

**(b)** Write the **schemas** ( TableName ( attribute1, attribute2, … ) ) for a pair of decomposed tables that correct the problem.

Vehicle (make, model, type)

WeightRange (Minimum, WeightClassification)

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4. The first six normal forms (all except DKNF) take aim at three different types of problems.

**(a)** What are the three types of problems?

1. Non-atomic values and repeated valuese

2. Functional dependency problems

3. Multi-valued dependency problems

**(b)** Which normal forms apply to each type of problem above?

1. 1NF

2. 2NF, 3NF, and BC NF

3. 4NF and 5NF