

# Assignment 2: Bicycle Shop

CS 410/510: Databases

Due: **Feb. 7, 2018 at midnight**

## Problem Description

The *Velocipede Emporium* needs a database to manage their sales of parts and service. Here are some of the things they need to track:

- Customers are billed and pay in terms of an *invoice*, describing the parts sold and work done for a particular transaction.
- Each invoice is sold by a particular employee, the one who rang up the final transaction.
- On a given invoice, customers can buy various items (e.g. parts, bicycles, accessories). Work performed will also appear line items on the invoice.
  - Goods sold have a description, a quantity, and a unit price. They also have an item ID/SKU to tie it in to an inventory system.
  - Work is performed by a particular employee, has a description, and a cost.
  - Tip: work can also be modeled with a quantity and unit price; an hourly billing rate for general labor, and a quantity of 1 for work with a standardized billing rate, such as \$25 for a brake tune-up.
- Work is also performed on a specific bicycle.
- Customers can have more than one bicycle.
- Track basic information about customers (name, billing address, phone number, etc.)
- An invoice may have an associated *work order*, which is a request for work to be done; that work will be added to the invoice when it is complete. Work orders may be assigned to particular employees.

## *Simplifying Assumptions*

- Each invoice is sold to a single customer.
- Each bicycle is owned by a single customer.
- We do not need to model an inventory or payroll system.

**Part 1: Users and Questions (10 points)**

Identify three different users (direct or indirect) of this system.

For each user, identify 3 questions they might want to answer with the database.

*You may work on this part of the assignment in groups; list your group members in your final submission.*

**Part 2: User Schemas (30 points)**

Using E-R syntax, draw a *user schema* for each of your three users. This should capture the data as that user will see it; it should not contain things they are unlikely to care about.

**Part 3: Logical Schema (30 points)**

Using E-R syntax, draw a single integrated logical schema for this database. It should capture all of the information discussed in the Problem Description, and be capable of answering all the questions you identified in part (1).

**Part 4: Relational Model (20 points)**

Describe a set of relations that will store the data from your logical schema in part (3). For each relation, give:

- Its name
- The entity or relationship type it stores
- Its attributes, along with their approximate data type (number, string, date)
- Its primary key
- Its foreign key(s), and the relations that they reference

**Part 5: Example Data (10 points)**

For each of your relations in part (4), give 2-5 example rows.

All data must be referentially valid (that is, a foreign key value in one table must refer to a valid primary key value in the table that it references).