**INFS 6790**

**Seminar in Database Management**

Homework #1

Being able to not only identify flaws in designs, but being able to explain why it is a flaw, or explain why one design decision is better than another, is important when you work in large database environments. Not all design decisions in a database are dictated by normalization, such as preferring a numeric attribute as a primary key instead of a long, descriptive, text attribute. However, normalization is a well-defined and well-known process that addresses many design issues. Your assignment is to demonstrate your ability to identify design flaws that are based on normalization.

Part 1:

For each normal form (1NF, 2NF, 3NF, BCNF, 4NF, and 5NF), write an explanation of the criteria for achieving that normal form. The explanation must be in **YOUR OWN WORDS**. If you simply repeat the definition from one of the articles or class lecture, you will not receive credit. You must **EXPLAIN** the criteria, not just state them. Use subheadings to label your discussion of each normal form.

Part 2:

Assess the normalization of the attached data model for a brewing company. For each entity in the model, you should:

* Identify the highest normal form to which the entity conforms.
* Explain **completely** how the entity violates the next normal form (unless it is in 5NF, of course). For example, if you state that the highest normal form to which a given entity conforms is 2NF, then you must explain **EVERY** violation of 3NF in the entity. Be certain to include every violation of the next normal form, but do not include poor design decisions that are not related to normalization.

Normalization Report Data Model

This data model depicts the creation and sale of beer by BeerCo. A batch of beer is created using a number of ingredients specified in a recipe for a specific product. A recipe is comprised of multiple different ingredients, and a record is kept for each ingredient in that recipe. Batches of beer can vary in size over time, thus requiring different amounts of the ingredients. Batches are created in set time periods – there is a defined begin and end date for each batch. BeerCo. only makes a single batch of a given beer at a time. To try to get the product sold, the salesperson will advertise the beer in multiple size offerings (cans, bottles, kegs, etc.). The current sales price is how much BeerCo is advertising that they will sell the product for. This price can change over time.

**INGREDIENT** – a table for storing data on the ingredients used in making beer. BeerCo gets any specific ingredient from only one supplier.

**PRODUCT** – a table for storing data on the beer products created by BeerCo.

**RECIPE** – a table for storing data on which ingredients a specific beer uses in brewing.

**BATCH** – a table for storing data on individual batches of beer.

**SALESPERSON** – table for storing data on the salespeople that try to sell beer to stores.

**CUSTOMER** – table for storing data on the stores that buy and sell beer and beer storage devices.

**TRANSACTION** – table for storing data on which parties are associated with a beer sale/purchase either as a buyer (becoming the new owner) of the beer/beer storage or a seller (the original owner) of the beer/beer storage. A specific instance of a beer itself can only have a single transaction, but beer storage can be bought and sold by both BeerCo. and the customers. Data on the sellers (the original owners) is necessary to create the listing.

INGREDIENT

*IngredientID* – the identification number assigned to an ingredient instance (i.e. ID1 could be for Hops, dry category, and ID2 could be Hops, perishable category).

*Name* – the name of the ingredient.

*Supplier* – the name of the supplier of the ingredient.

*Classification* – the category of the ingredient (wet, dry, perishable, etc.).

*UnitofSize* – some ingredients are measured by the ounce, some by the pound, some by the liter, etc.

*UnitPrice* – the cost of purchasing one unit of the ingredient.

RECIPE

*RecipeID* – the identification number assigned to a recipe.

*IngredientID* – the identification number assigned to an ingredient used in this recipe.

*Amount* – amount of the ingredient used in this recipe

BATCH

*BeerID* – the identification number assigned to a specific product.

*RecipeID* – the identification number assigned to the recipe for this batch.

*IngredientID* – the identification number assigned to an ingredient which the current recipe will use.

*BatchBeginDate* – the date on which the batch of beer began brewing.

*BatchEndDate* – the date on which the batch of beer stopped brewing.

*AmountProduced* – the quantity of beer created by this recipe.

*RecipeCost* – the total cost associated with brewing this batch of beer based on the ingredients.

PRODUCT

*BeerID* – the identification number assigned to a specific product.

*Name* – the name of the beer.

*Address* – the address (street, city, state, and ZIP code) where this beer is always brewed

*Size* – the amount of beer in a single package (can, bottle, 6-pack, keg, etc.).

*SPNumber –* the identification number assigned to the salesperson responsible for selling this product.

*CreatedDate* – the date on which the beer was first created.

*OriginalSalesPrice* – the price that BeerCo. asked buyers to pay for the beer when it was first offered for sale.

*CurrentSalesPrice* – the price that BeerCo. currently asks buyers to pay for the beer. While the asking price of the beer may change many times, only the original asking price and the most current asking price need to be retained by the system.

*Storage?* – whether or not BeerCo. offers storage items for this product.

SALESPERSON

*SPNumber –* an identification number assigned to a salesperson.

*FirstName* – the first name of the salesperson.

*LastName* – the surname or family name of the salesperson.

*PhoneNumber* – the contact phone number for the salesperson that is given to customer. For most salespeople, this is a cell phone number. For other salespeople, it can be an office number. Some salespeople have both a cellphone number and office number.

TRANSACTION

*TransactionDate* – the date and time on which the sale occurred.

*TaxID* – the identification number assigned to the business associated with the sale.

*BeerID –* an identification number given to the product being listed for sale.

*Role* – an indicator of whether the customer is being entered as a “buyer” or “seller” of the product. The customer cannot have both roles in the same transaction.

CUSTOMER

*TaxID* – the federal tax ID number of the business that is either buying or selling beer or beer storage. It is used as a unique identifier for each customer.

*BusinessName* – the business name of the buyer or seller.

*Phone* – the primary contact phone number for buyer or seller. While a business may have many potential contact numbers, this system should only track the one and only one phone number that is their primary contact number.

*Space* – the amount of retail space dedicated to BeerCo.’s products.

