**CS 360: Database Systems**

Department of Computer Science

University of Idaho

***Assignment #5***

**Instructor**: Hasan Jamil **Semester**: Fall 2023

Total Points: 20 Due: October 19, 2023

Consider a relational database for pet food information management with the following scheme. In such schemes, relation names are usually italicized, and primary keys are usually underlined. In the schemes below, attributes have their usual meanings. Table *Pets* stores pet details where PetID is a unique pet ID. In *Owners* and *Owns*, OID means owner ID, which is unique in *Owners*. The PetID in *Owns*, PetID in *Likes* and PetID in *Pets* have identical domains, and PetID refers to the PetID in *Pets*. FoodID in *Foods* and FoodID in *Purchases* have identical domains, and FoodID in *Purchases* refers to FoodID in *Foods*. FoodID is unique in *Foods*. TypeofFood in all schemes mean the intended consumer of the food – e.g., dog, or bird, while the name of the food says what the item is – e.g., bone, and the brand captures the maker of the food item – e.g., Meow Mix. Note that the TypeofPet in *Pets* and TypeofFood in *Foods* have identical domains. The ClassofFood reflects the category of food such as dry food or wet food. ItemWeight in *Foods* shows the net package weight. In *Purchases*, Quantity refers to the number of packages of the food item bought. In *Owns*, Year refers to the year when the pet was adopted and PetAgeatOwnership is the age of the pet when it was adopted or purchased. The PricePaid in *Owns* is set to a non-zero value if the pet was bought from a store, zero if it was adopted from another owner at no cost.

*Pets*(PetID, Name, Age, Street#, City, ZipCode, State, TypeofPet)

*Owners*(OID, LastName, Street#, City, ZipCode, State, Age, AnnualIncome)

*Owns*(PetID, Year, OID, PetAgeatOwnership, PricePaid)

*Likes*(PetID, TypeofFood)

*Foods*(FoodID, Name, Brand, TypeofFood, Price, ItemWeight, ClassofFood)

*Purchases*(OID, FoodID, PetID, Month, Year, Quantity)

Write the following queries in **Relational Algebra**. [20 points]

1. List all pets (PetID, Name, TypeofPet) living in Moscow, Idaho and owned by a minor who has no income. List the pets in ascending order of their names and in descending order of their pet type when the names are identical.
2. List all pet owners and their pets (OID, LastName, PetID, Name) who buy the most expensive food for the pet type.
3. List pets (PetID, Name) which have names such that at least another pet in each 50 US states also have.
4. List the food brands (Brand) that sells the most expensive food in each class of pet foods.
5. List the highest priced food for each brand (FoodID, Brand, Price).