

Database and Information Systems

Homework 2

Due on 10/4/2005

For this assignment, you will want to test your queries by running them on a real database. So please begin by signing up for an Oracle account (<http://www.seas.upenn.edu/ora>), accessible from eniac. (For those who do not have eniac accounts, please email the instructor.) Then read over the Oracle setup instructions from the course web page (<http://www.seas.upenn.edu/zives/cis550/oracle-faq.html>) and modify your eniac .cshrc file as directed. Also read over the Oracle guide referenced from the course web pages (<http://www.cs.wisc.edu/dbbook/openAccess/thirdEdition/Oracle/userguide/oracleguide.html>). Finally, download **hw2.sql** to your eniac account, launch Oracle (using the command **sql**), and then **start hw2** to create some sample tables for Problems 1 and 3. These will only be sparsely populated to test your solutions, you may need to INSERT more VALUES into the tables.

Note 1: The SQL string datatype is **VARCHAR(*length*)**, and you'll need to choose an appropriate length.

Note 2: The key fields are underlined in schema. Foreign keys are indicated by naming. (In other words, if x is the key of relation X, then each appearance of x outside of X is a foreign key referencing X).

Problem 1 [30 points]: Consider the following schema based on the TPC-H benchmark (which you'll hear more about later on in the course):

Parts(partID: int, name: string, mfg: string, brand: string, type: string, retailprice: float)

Suppliers(suppID: int, name: string, address: string, nationID: int, phone: string, acctbal: float)

PartSupp(partID: int, suppID: int, availqty: int, supplycost: float)

Nation(nationID: int, name: string, regionID: int)

Region(regionID: int, name: string)

Write the following queries in SQL:

1. Find the IDs of suppliers with account balance < \$1000.
2. Find total number of suppliers in nation 'USA'.
3. Find the brands of parts that are supplied by suppliers in region 'North America'.

4. Find the IDs of parts which are supplied by 3 different suppliers in nation 'USA'.
5. $\{\langle n \rangle | \exists s, a, t, h, b, p, e, m, r, y, i, v, c (\langle s, n, a, t, h, b \rangle \in \text{supplier} \wedge \langle p, s, v, c \rangle \in \text{partsupp} \wedge \langle p, e, m, r, y, i \rangle \in \text{parts} \wedge m = 'widget' \wedge v > 50) \}$

Problem 2[30 points]: Consider the following schema:

Employee(eid: int, *ename*: string, *age*: int, *salary*: float)
 Department(did: int, *budget*: float)
 Manager(mid: int, *mname*: string)
 Works(*eid*: int, *did*: int, *workinghours*: int)
 Admins(*mid*: int, *did*: int)

Write the SQL DDL statements to create these relations, including all primary and foreign key integrity constraints.

Problem 3[40 points]: Use the schema from Homework 1's PBAY system:

Sellers(sellerID: int, *rating*: char, *email*: string)
 Items(itemID: int, *type*: string)
 Buyers(buyerID: int, *email*: string, *address*: string)
 Stock(*itemID*: int, *sellerID*: int, *startBid*: float, *quantity*: int, *endingTime*: int)
 Purchases(*itemID*: int, *buyerID*: int, *sellerID*: int, *price*: float, *purchaseQuantity*: int, *bidTime*: int)

Write the following queries in SQL:

1. Find the types of items that are in stock.
2. Find the IDs of sellers who either have sold some items or still have items in stock.
3. Find the total price each buyer has paid for each item type. (Total price = price $\times$ purchase quantity. Also note that you don't need to return 0 for purchases that aren't made.)
4. Find the types of items stocked by ≥ 2 sellers but not bought by any buyer.
5. Find the IDs of buyers who have purchased some item with a price lower than the average price for that item type.
6. Find the names of buyers who bought 3 same items from sellers who have a 'book' in stock.
7. $\pi_{rating}(\pi_{sid}(\sigma_{i1 \neq i2 \wedge s1 = s2}(\rho_{itemID \rightarrow i1, sellerID \rightarrow s1}(Stock)) \bowtie \rho_{itemID \rightarrow i2, sellerID \rightarrow s2}(\sigma_{quantity \geq 3}(Stock)))) \bowtie Sellers)$