

Database and Information Systems

Homework 1

September 11, 2003; Due September 18 at 1:30 PM

Problem 1: Consider the Penn Ebay (PBAY) System which is represented by the following schema:

Sellers(*sellerID*:integer,*rating*:char,*email*:string)
 Items(*itemID*:integer,*description*:string,*startBid*:real,*sellerID*:integer,*qty*:integer)
 Purchases(*purchaseNumber*:integer,*itemID*:integer,*custID*:integer,*count*:integer,*soldFor*:real)
 Customers(*custID*:integer,*address*:string)

Write the following queries in relational algebra, tuple relational calculus and domain relational calculus:

1. Find the ID's of sellers of items with starting bid \geq \$1000
2. Find the ID's of customers who bought ≥ 2 of the same item or bought an item that a seller had with quantity 1.
3. Find the ID's of items stocked by every seller with rating A
4. Find the ID's of items which are stocked by ≥ 2 sellers.
5. Find the ID's of items which are stocked by ≥ 2 sellers who have different starting bids for the item.
6. Find the ID's of items that are only sold for \leq \$1000, by any seller.

Problem 2: Consider the following schema:

Suppliers(*sid*:integer,*sname*:string,*address*:string)
 Parts(*pid*:integer,*pname*:string,*color*:string)
 Catalog(*sid*:integer,*pid*:integer,*cost*:real)

State what the following queries compute:

1. $\pi_{sname}(\pi_{sid}(\sigma_{color='red'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers)$
2. $\pi_{sname}(\pi_{sid}((\sigma_{color='red'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog))) \bowtie Suppliers)$
3. $(\pi_{sname}((\sigma_{color='red'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers)) \cap (\pi_{sname}((\sigma_{color='green'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers))$

4. $(\pi_{sid}((\sigma_{color='red'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers)) \cup$
 $(\pi_{sid}((\sigma_{color='green'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers))$
5. $\pi_{sname}((\pi_{sid,sname}((\sigma_{color='red'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers)) \cap$
 $(\pi_{sid,sname}((\sigma_{color='green'}(Parts)) \bowtie (\sigma_{cost < 100}(Catalog)) \bowtie Suppliers)))$

Problem 3: Problem 4.6 from the textbook. It is reproduced here.

What is *relational completeness*? If a query language is relationally complete, can you write any desired query in that language?