

Name: \_\_\_\_\_

This quiz is **open book, open notes**, but there can be no sharing of any material. Some questions in this quiz use the database schema (and sample instance) depicted below. The columns **MPix**, **MaxAp**, and **Price** are of type real. The columns **Rating**, **RDate**, and **Desc** are of types, respectively, integer, date, and CLOB. All other columns are of type **varchar(30)**. When asked for relational algebra or SQL expressions of queries, you must provide answers that work for all possible database instances, not just the example instance depicted below. Do not assume any constraints other than the key constraints implied by the underlined attributes. For brevity, relational algebra expressions abbreviate the schemas of the **DigiCams**, **Catalog**, and **Reviews** tables as  $D(M, L, P, A)$ ,  $C(S, M, L, P)$ , and  $R(S, T, M, L, R, D)$ , respectively.

DigiCams				Catalog			
<u>Manufacturer</u>	<u>Model</u>	MPix	MaxAp	<u>Store</u>	<u>Manufacturer</u>	<u>Model</u>	Price
Canon	G3	3.9	2.0	Joe's Place	Olympus	4040	599.99
Canon	G2	3.9	2.0	Snap Chap	Olympus	4040	655.00
Nikon	4500	3.87	2.6	Zonama	Canon	G2	698.50
Olympus	4040	3.9	1.8	Zonama	Olympus	3030	488.55
Olympus	3030	3.14	2.8	Zonama	Nikon	4500	589.95

  

Reviews					
<u>Source</u>	<u>RDate</u>	<u>Manufacturer</u>	<u>Model</u>	Rating	Desc
Photo Life	2002-02-03	Canon	G2	9	Our lab...
Photo Life	2001-08-22	Olympus	4040	7	When I...
PC Mag	2002-09-15	Nikon	4500	8	Often a...

- (1 pt) Write your name in the space provided above.
- (3 × 3 pts) Exhibit the results of evaluating each of the following SQL queries on the above database instance.
  - `select * from Catalog where price < 600;`

(b) `select M1.Manufacturer, M2.Manufacturer  
from DigiCams M1, DigiCams M2  
where M1.Manufacturer <> M2.Manufacturer and  
M1.manufacturer > 'Minolta' and M2.manufacturer > 'Minolta';`

(c) `select D.Manufacturer  
from DigiCams D, Reviews R  
where D.Manufacturer = R.Manufacturer and R.Rating >= 8 and  
D.MaxAp <= 2;`

3. (3 × 3 pts) Exhibit the results of evaluating each of the following relational algebra expressions on the above database instance. Note the abbreviations described earlier.

Bag operators are identified using the superscript  $\mathcal{B}$ ; the rest are set operators.

(a)  $\pi_{SD} \sigma_{R \geq 8} R$

(b)  $\pi_S^{\mathcal{B}} C -^{\mathcal{B}} \pi_S C$  (The second projection is a set operator.)

(c)  $\pi_M((\pi_M \sigma_{P \geq 3.5} \pi_{MP} D \cup \pi_M \sigma_{A \geq 2.5} D) \times \pi_M D)$ .

4. ( $3 \times 3$  pts) Write SQL queries as directed.

- (a) For each camera (manufacturer and model), list its MPix value along with the ratings it received from each source that reviewed it. Ignore cameras with no reviews. The result consists of tuples of the form  $(m, l, p, s, r)$ , indicating that model  $l$  from manufacturer  $m$  has MPix  $p$  and received a rating of  $r$  from source

s.

(b) For each camera (manufacturer and model), list the lowest price in the Catalog. Ignore cameras with no price information. Sort the result in ascending order of manufacturers and (among cameras of a manufacturer) descending order of models. The desired result consists of tuples of the form  $(m, l, p)$ , where  $p$  is the lowest price for model  $l$  from manufacturer  $m$ .

(c) For each review source, list the cameras (manufacturers and models) that received the highest ratings, along with the **MaxAp** values for those cameras. The desired result consists of tuples of the form  $(s, m, l, a)$ , indicating that camera model  $l$  from manufacturer  $m$  has maximum aperture value  $a$  and is (one of) the highest rated cameras according to source  $s$ . Hint: subquery.

5. ( $3 \times 3$  pts) Write relational algebra queries as directed, using only the operators  $\sigma$ ,  $\pi$ ,  $\times$ ,  $\rho$ ,  $\cup$ , and  $-$ .

(a) List the ratings for Olympus 4040. (The result is a unary relation.)

(b) List cameras (manufacturers and models) in DigiCams that have no reviews.

(c) A query equivalent to the query in Question 4a.