

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 (which we have encountered earlier). For brevity, relational algebra expressions abbreviate the schemas of the tables as indicated next to the table names below. The last page of this quiz duplicates the tables below. You may tear it off for easier reference as you work on the questions. You do not need to reattach it.

DigiCams $D(M, L, P, A)$				Catalog $C(S, M, L, P)$			
<u>Manufacturer</u>	<u>Model</u>	MPix	MaxAp	<u>Store</u>	<u>Manufacturer</u>	<u>Model</u>	Price
varchar(30)	varchar(30)	real	real	varchar(30)	varchar(30)	varchar(30)	real
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 $R(S, T, M, L, R, D)$					
<u>Source</u>	<u>RDate</u>	<u>Manufacturer</u>	<u>Model</u>	Rating	Desc
varchar(30)	date	varchar(30)	varchar(30)	integer	CLOB
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. (1 pt) Write your name in the space provided above.
2. (3 × 5 pts) Assume that the tables depicted above have already been created and populated. Write SQL statements to declare the constraints described below:
  - (a) The primary key of DigiCams is (Manufacturer, Model).

(b) The values in the `Rating` column of `Reviews` must be in the range  $[0, 10]$ .

(c) Every value for the `(Manufacturer, Model)` pair that occurs in `Catalog` must also occur in `DigiCams` (in the like-named columns).

3. ( $2 \times 5$  pts) Write SQL triggers as directed.

(a) Write a trigger that disallows any change to the `Rating` attribute of an existing tuple in `Reviews`.

(b) Instead of disallowing updates to the `Rating` column of `Reviews` as suggested by Question 3a, we now wish to permit such updates. However, whenever there is any update (not insert or delete) to a tuple in `Reviews`, we wish to record the old state of that tuple in a table `OldReviews` whose schema is identical to that

of `Reviews`, except that all attributes of `OldReviews` are key attributes. Write a trigger that implements this logic. (Assume that the trigger of Question 3a does not exist for this question.)

4. (5 pts) Mark conflicts in the following history, using the arrow notation used in class. (We use  $r_i(d)$  and  $w_i(d)$  to denote transaction  $i$  reading and writing, respectively, data item  $d$ .)

$r_1(a), r_3(b), w_3(b), r_1(b), w_1(a), r_2(a), w_2(a), r_1(c), w_1(b), w_1(c), r_3(a), r_3(c)$

5. (4 + 5 pts) Consider relational schema  $R(A, B, C, D, E)$  with functional dependencies  $A \rightarrow B$ ,  $B \rightarrow C$ ,  $BD \rightarrow E$ , and  $E \rightarrow C$ .
- (a) List all keys of  $R$ . Explain why the sets of attributes you list are keys **and** why there are no other keys.

- (b) Decompose (if needed)  $R$  to generate a BCNF schema. Briefly explain why your final schema is in BCNF. If you decompose any relations, indicate the functional dependency used for the decomposition.

# Scratch Page

You may tear off this page for easier reference. **This page will not be graded.**

DigiCams  $D(M, L, P, A)$

Catalog  $C(S, M, L, P)$

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Reviews  $R(S, T, M, L, R, D)$

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