

**CS 589: Quiz 5, 10 November 2008 Name: \_\_\_\_\_ KEY \_\_\_\_\_**

**No books or notes. Work individually.**

Question 1(10 points): In the process of query optimization, sometimes expressions are generated that can be immediately simplified. Propose simplified forms for each of the algebra expressions below.

DE is duplicate elimination, G1 is scalar group-by, G is vector group-by and  $\cup^+$  is duplicate-preserving union. Let  $\emptyset$  be the empty relation (no tuples) over the appropriate schema.

*Assume all expressions are well-formed and that  $r$  has no duplicates.*

a.  $r - r \equiv \emptyset$

b.  $\emptyset \cup r \equiv r$

c.  $DE(G1[\text{Count}(\ast) \text{ as } CA](r)) \equiv G1[\text{Count}(\ast) \text{ as } CA](r)$  (*since scalar group-by gives 1 row*)

d.  $r \bowtie \pi_{AB}(r) \equiv r$

e.  $\pi_{AB}(\pi_{ABC}(r)) \equiv \pi_{AB}(r)$

f.  $\sigma_{A=5}(\sigma_{A=5}(r)) \equiv \sigma_{A=5}(r)$

g.  $\sigma_{A=5}(\sigma_{A=6}(r)) \equiv \emptyset$

h.  $r \cap r \equiv r$

i.  $DE(r \cup^+ r) \equiv r$

j.  $G[A, \text{Min}(CM1) \text{ as } CM2](G[AB, \text{Min}(C) \text{ as } CM1](r)) \equiv G[A, \text{Min}(C) \text{ as } CM2](r)$