HW1 KEY - CS589 - FALL 2008

(2pts) 1.1 $N_2 \leq N \leq N_1 + N_2$, R_1 & R_2 must be union compat.
- $N_1 + N_2$: no tuples in common
- N_2: $R_1 \subseteq R_2$

(2pts) 1.2. $\emptyset \leq N \leq N_1$, and R_1 & R_2 union compat
- N_1: $R_1 \subseteq R_2$
- $\emptyset$: $R_1 \not\subseteq R_2$ (i.e. $R_1 \cap R_2 = \emptyset$)

(2pts) 1.3. $\emptyset \leq N \leq N_1$, and R_1 & R_2 union compat.
- N_1: $R_1 \cap R_2 = \emptyset$
- $\emptyset$: $R_1 \subseteq R_2$

(2pts) 1.4 $N \equiv N_1 \times N_2$, and for completeness, $\not\equiv$ schema(R_1) $\cap$ schema(R_2) $= \emptyset$

(2pts) 1.5. $\emptyset \leq N \leq N_1$, and $a \in$ schema(R_1), and a's type must be comparable to "5"
- N_1: all qualify
- $\emptyset$: none qualify

(2pts) 1.6. $1 \leq N \leq N_1$, and $a \in$ schema($R1$)
- 1: a is a candidate key for R_1
- N_1: a is the same in all $t \in R_1$

(2pts) 1.7. $N \not\equiv \emptyset$, and schema($R1$) $\supseteq$ schema(R_2)
- since $N_2 > N_1$, R_1 can never have enough tuples such that it "covers" the rows in R_2

(5pts) 2.1. Names of suppliers of parts in the catalog that cost < $100.

Explanation:

$$\pi_{sname}(\pi_{sid}(\sigma_{color=red} Parts) \bowtie (\sigma_{cost<100} Catalog) \bowtie Suppliers)$$

$$= \pi_{sname}(\emptyset \bowtie (\sigma_{cost<100} Catalog) \bowtie Suppliers)$$

$$= \pi_{sname}((\sigma_{cost<100} Catalog) \bowtie Suppliers)$$

(5pts) 2.2. Names of suppliers who supply both green parts under $100 and red parts under $100

(5pts) 3.1. $\{T \mid \exists C \in Catalog\ \exists S \in Suppliers$

$(C.cost < 100 \wedge C.sid = S.sid \wedge T.sname = S.sname)\}$

(5pts) 3.2 $\{T \mid \exists P_1, P_2 \in Parts\ \exists C_1, C_2 \in Catalog\ \exists S_1, S_2 \in Suppliers$

$($

$((P_1.color = red) \wedge (C_1.cost < 100) \wedge (P_1.pid = C_1.pid) \wedge (C_1.sid = S_1.sid))$

$\wedge ((P_2.color = green) \wedge (C_2.cost < 100) \wedge (P_2.pid = C_2.pid) \wedge (C_2.sid = S_2.sid))$

$\wedge (T.sname = S_1.sname)$

$\wedge (T.sname = S_2.sname)$

$)\}$

(5pts) 4.1. $\{x_1 : SNAME \mid \exists x_2 : SID (\exists x_6 : sid (\exists x_3 : ADDRESS$

$(\exists x_4 : PID (\exists x_5 : COST$

$((x_5 < 100) \wedge (x_2 = x_6) \wedge$

$SUPPLIERS(x_2, x_1, x_3) \wedge$

$CATALOG(x_6, x_4, x_5)))))\}$ (d)

(5pts) 4.2 $\{x : SNAME \mid \exists p_i : pid(\exists p_{n_1} : pname(\exists c_i : cost(\exists a_i : address$

$(\exists s : sid (\exists p_2 : pid (\exists p_{n_2} : pname(\exists c_2 : cost($

$\exists a_2 : address($

$Parts(p_1, n_1, 'red') \wedge Catalog(s, p_1, c_1) \wedge c_1 < 100$

$\wedge Suppliers(s, x, a_1)$

$\wedge Parts(p_2, n_2, 'green') \wedge Catalog(s, p_2, c_2)$

$\wedge c_2 < 100 \wedge Suppliers(s, x, a_2)))))))\}$ (d)

NOTE: shorthanding with constants, e.g. $Parts(p_2, n_2, 'green')$, might be considered cheating a bit, but it's shorter.

REF: This answer adapted from a student paper. Thanks! to J.N.

5. FOLLOWING THE EXAMPLE IN THE BOOK.

(2 pts) a) schema (Supply chain) = {Supplier, Part}
schema (Project Reqts) = {Part, Project}

Supply Chain

Supplier	Part
Bob	Widget
Jim	Whatsit
Bob	Thingy

Project Reqts

Part	Project
widget	A
widget	B
thingy	A
thingy	B
whatsit	A

(2 pts) b) {Bob, B}

(2 pts) c) Show the list of suppliers that supply <u>all</u> parts for some project.