Carnegie Mellon University
15-415 Database Applications
Spring 2012, Faloutsos
Assignment 1 : ER + Formal Q.L.
Due: 2/07, 1:30 pm, in class – hard copy

Solution

Question 1 : Olympic Database [10 points]
Q1.1 Any of the solutions below is fine.

Solution #1

Solution #2
Q1.2

CREATE TABLE ATHLETE

    (ssn CHAR(11), name CHAR(20), birthdate DATE, PRIMARY KEY (ssn) )

CREATE TABLE OLYMPIAD

    (year INTEGER, country CHAR(30), city CHAR(30), PRIMARY KEY (year) )

CREATE TABLE PARTICIPATE

    (ssn CHAR(11) NOT NULL, year INTEGER NOT NULL, sport CHAR(30),
     PRIMARY KEY (ssn, year, sport),
     FOREIGN KEY (ssn) REFERENCES ATHLETE,
     FOREIGN KEY (year) REFERENCES OLYMPIAD)
Question 2: Cuisine Database [10 points]

Q2.1
Question 3 : Student Database [20 points]

Q3.1

Q3.2 Yes. They are overlapping constraints since a student can belong to both schools.

Q3.3 No. There are other schools than the two schools.

Q3.4

CREATE TABLE STUDENT

    (ssn CHAR(11), name CHAR(20), age INTEGER, PRIMARY KEY (ssn) )

CREATE TABLE ENG-STUDENT

    (ssn CHAR(11), E-SAT INTEGER, PRIMARY KEY (ssn),
     FOREIGN KEY (ssn) REFERENCES STUDENT,
     ON DELETE CASCADE )

CREATE TABLE FA-STUDENT

    (ssn CHAR(11), FA-SAT INTEGER, PRIMARY KEY (ssn),
     FOREIGN KEY (ssn) REFERENCES STUDENT,
     ON DELETE CASCADE )
Question 4 : Relational Algebra [20 points]

Q4.1 $\pi_{v\cdot ipaddr}[\sigma_{\text{date}='2/7/2012'}(\text{EVENT})]$ 

Q4.2 $\pi_{os}[\sigma_{v\cdot ipaddr='10.10.10.2'}(\text{MACHINE \bigtriangleup EVENTS.a\cdot ipaddr \cdot EVENT})]$ 

Q4.3.1 It gives all the attackers that attacked all the victims (and maybe more) attacked by the attacker 9.9.9.9.

Q4.3.2 It returns 1 column.

Q4.3.3 The column header is ‘a\cdot ipaddr’

Q4.3.4 It returns 2 rows.

Q4.3.5 The returned rows are 9.9.9.9 and 9.9.9.10.

Question 5: Relational Tuple Calculus [20 points]

Q5.1 $\{t \mid \exists d \in \text{EVENT} \ (d.\text{date} = '2/7/2012' \land t.\text{v} \cdot \text{ipaddr} = d.\text{v} \cdot \text{ipaddr})$ 

Q5.2 $\{t \mid \exists a \in \text{MACHINE}, \exists d \in \text{EVENT} \ (a.\text{ipaddr} = d.\text{a} \cdot \text{ipaddr} \land t.\text{os} = a.\text{os} \land d.\text{v} \cdot \text{ipaddr} = '10.10.10.2')$ 

Q5.3.1 It gives all the ip addresses of machines who are both a victim and an attacker.

Q5.3.2 It returns 1 column.

Q5.3.3 The column header is ‘ipaddr’

Q5.3.4 It returns 2 rows.

Q5.3.5 The returned rows are 9.9.9.1 and 10.10.10.1.
Question 6: Relational Domain Calculus [20 points]

Q6.1 \[< v \rightarrow ipaddr > | \exists aip(< aip, v \rightarrow ipaddr,'2/7/2012' > \in \text{EVENT})\]

Q6.2 \[< os > | \exists am, \exists aip, \exists d(< am, aip, os > \in \text{MACHINE} \land < aip,'10.10.10.2', d >\in \text{EVENT})\]

Q6.3.1 It gives all the attackers’ machine names who attacked Windows machines.

Q6.3.2 It returns 1 column.

Q6.3.3 The column header is ‘mname’

Q6.3.4 It returns 3 rows.

Q6.3.5 The returned rows are Jupiter, Sun, and Mars.