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 CptS 451
 24 May 2020

Question 2.

Consider the following relations:

Relation R1

<u>A</u>	X
a1	x1
a2	x1
a3	x3
a4	x4
a5	x10
a5	x1

Relation R2

<u>B</u>	Y
b1	y1
b2	y5
b3	y8
b5	y1

Relation R3

<u>C</u>	A	B
c1	a1	b3
c2	a1	b2
c3	a2	b1
c4	a2	b3
c5	a2	b5
c6	a5	b1
c7	a5	b2

Relation R4

<u>D</u>	C
d1	c3
d2	c3
d3	c3
d4	c1
d5	c1

Relation R5

<u>A</u>	<u>B</u>	Z
a3	b1	z1
a3	b3	z2
a3	b5	z3
a5	b5	z3

Primary Keys (refer to these as PK1 through PK5):

1. Relation **R1**: A
2. Relation **R2**: B
3. Relation **R3**: C
4. Relation **R4**: D
5. Relation **R5**: A,B

The following foreign key constraints are given for relations R1, R2, R3, R4, and R5:
 (refer to these as FK1 through FK5)

1. **R3(A)** references **R1(A)**
2. **R3(B)** references **R2(B)**
3. **R4(C)** references **R3(C)**
4. **R5(A)** references **R1(A)**
5. **R5(B)** references **R2(B)**

For all foreign keys:

- assume "CASCADE" policy for delete operations, and
- assume "SET NULL" policy for update operations.

a) (6pts) For the operations given below, indicate whether execution of the operation would violate some "primary key" or "foreign key constraints". If your answer is yes, specify the constraints (from the above list) that would be violated (e.g. violates FK1) Make the changes on the original tables for each operation below.

i. Insert tuple ('c8', 'a5', 'b4') into R3.

REJECT INSERTION

FK2 violated. This insertion violates the foreign key constraint: R3(B) references R2(B). Since 'b4' does not exist in R2, the insertion is rejected.

ii. Insert tuple ('a6', 'b6', 'z3') into R5.

REJECT INSERTION

Violates FK4 and FK5

iii. Insert tuple ('a5', 'b5', 'z3') into R5.

Tuple inserted

iv. Insert tuple ('a6', 'x1') into R1.

Tuple inserted

v. Insert tuple ('d5', 'c1') into R4.

Tuple inserted

vi. Insert tuple ('c9', NULL, NULL) into R3.

REJECT INSERTION

Violates FK3

b) (24pts) For the operations given below, indicate whether execution of the operation would violate any "primary key" or "foreign key constraints". If your answer is yes:

- specify the constraints (from the above list) that would be violated, and
- apply "CASCADE" policy for delete operations, and apply "SET NULL" policy for update operations. Update the tables after applying those policies.

(For deletions, give the relation name and row-number(s) of the tuple(s) that will be deleted. For updates, if the update is possible rewrite the changed tables. Otherwise explain why update can't be performed.) Make the changes on the original tables for each operation below.

- i. Delete tuple ('a3', 'x3') from R1.
Foreign key constraint: FK4
Remove row 3 from R1
Apply cascade policy and remove rows: 1, 2 and 3 from R5
- ii. Delete tuple ('b1', 'y1') from R2.
Foreign key constraint: FK2
Remove row 1 from R2
Apply cascade policy and remove rows: 3 and 6 from R3, row 1, 2 and 3 from R4
- iii. Delete tuple ('a3', 'b1', 'z1') from R5.
(No constraints violated)
Remove row 1 from R5
- iv. Update tuple ('a4', 'x4') in R1 with values ('a6', 'x4').
(No constraints violated)
Update row 4 in R1 with the new values
- v. Update tuple ('b3', 'y8') in R2 with values ('b6', 'y8').
Foreign key constraint: FK2
Update row 3 in R2
Set b3 to null in row 1 and 4 in R3
- vi. Update tuple ('c1', 'a1', 'b3') in R3 with values ('c1', 'a4', 'b4').
Foreign key constraint: FK2
Reject the update because 'b4' does not exist in R2

Submission Instructions:

HW2 will be submitted on Blackboard (HW2 dropbox under "Homeworks").

- Question 1: Write all the "CREATE TABLE" statements in text files and save it as HW2_Q1.sql
- Question 2: Write your answers in a Word file and save it as PDF. Name your file "HW2_Q2.pdf").
- Attach both files to the dropbox. Please don't zip the files.

Email submissions will not be accepted.