PDPM

Indian Institute of Information Technology, Design and Manufacturing Jabalpur

Mid Sem – February 25, 2015

CS203 Database Design and Management

MM: 60 **Time: 2 Hours**

1. [10] Fill in the blanks:

   (a). The difference of relations R and S, denoted as R – S. The degree of the resulting relation is ______________________ the degree of the input relations.

   (b). ___________________ specify some restrictions on valid data which must be enforced at all times.

   (c). ____ handles DB access at runtime.

   (d). _____________________________ stores the description of the schema constructs and constraints.

   (e). There are multiple __________________ schemas but single internal schema.

   (f). DSL stands for _____________________________.

   (g). Mappings are keys for providing _____________________________________.

   (h). Intersection of two relations R and S, denoted as R ∩ S with using only difference operator is _____________________________.

   (i). A database is a ______________________________________ collection of integrated records.

   (j). _______________________ is a logical unit of work.

2. [2] Consider the following relations:

   Husband (marriage_license_no, hlname, hfname, hage)

   Wife (marriage_license_no, wlname, wfname, wage)

   and tell the meaning of the following query:

   $\pi_{(wlname,\ wfname)}(\sigma_{(hage > wage)}(Husband * Wife))$

   ____

   ____

3. [2+2] Perform natural join on the following relationships:

(a)

R

A	B	C
a	b	c
d	b	c
b	b	f
c	a	d

S

B	C	D
b	c	d
b	c	e
a	d	b

R*S

A	B	C	D

(b)

V

A	B
1	2
3	4

W

B	C	D
2	5	null
4	7	8
null	10	11

V*W

A	B	C	D

4. [2+1+2+1] A university database contains information about professors (identified by PF Number, say 'pfno') and courses (identified by 'cid'). Professors teach courses; each of the following situations concerns the "Teaches relationship set". University offers three semesters (even, odd, and summer) denoted as 'semno' in a 'year'. For each situation, draw an ER diagram that describes it (assuming no further constraints hold). Also write "teaches" relation in each case.

(a). Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded.

Teaches( )

(b). Professors can teach the same course in several semesters, and each offering must be recorded.

Teaches( )

5. [8] Consider the following tables X, Y, and Z:

X($\underline{a}$, b); Y($\underline{c}$, d); Z($\underline{e}$, f);

Suppose X(a, b) contains tuples (1,0), (2,4), (3,5), and (5,7). Suppose Y(c,d) contains tuples (1,5), (2,2), and (3,3). Suppose Z(e, f) = {(0,2), (1,1), (2,3)}.

The policy followed for deletion and updation is cascade. Perform the following operations on these relations in the given order considering integrity actions and show the contents of the tables after each step. Use set notation as used to write relation Z. The operations are (give reasons also):

(a). Insert (4,3) in X

X(a, b) = ____________________

Y(c,d) = {(1,5), (2,2), (3,3)}

Z(e, f) = {(0,2), (1,1), (2,3)}

____

____

(b). Insert (4,0) in Y

X(a, b) = ____________________

Y(c,d) = ____________________

Z(e, f) = ____________________

____

____

(c). Delete tuples from X where b>4

X(a, b) = ____________________

Y(c,d) = ____________________

Z(e, f) = ____________________

____

____

(d). Update c as 4 in the tuples from Y where c+d =4

X(a, b) = ______________________________

Y(c,d) = ______________________________

Z(e, f) = ______________________________

____

____

(e). Update a in X as ‘null’ where b=0.

X(a, b) = ______________________________

Y(c,d) = ______________________________

Z(e, f) = ______________________________

____

____

(f). Delete (0,4) from Z

X(a, b) = ______________________________

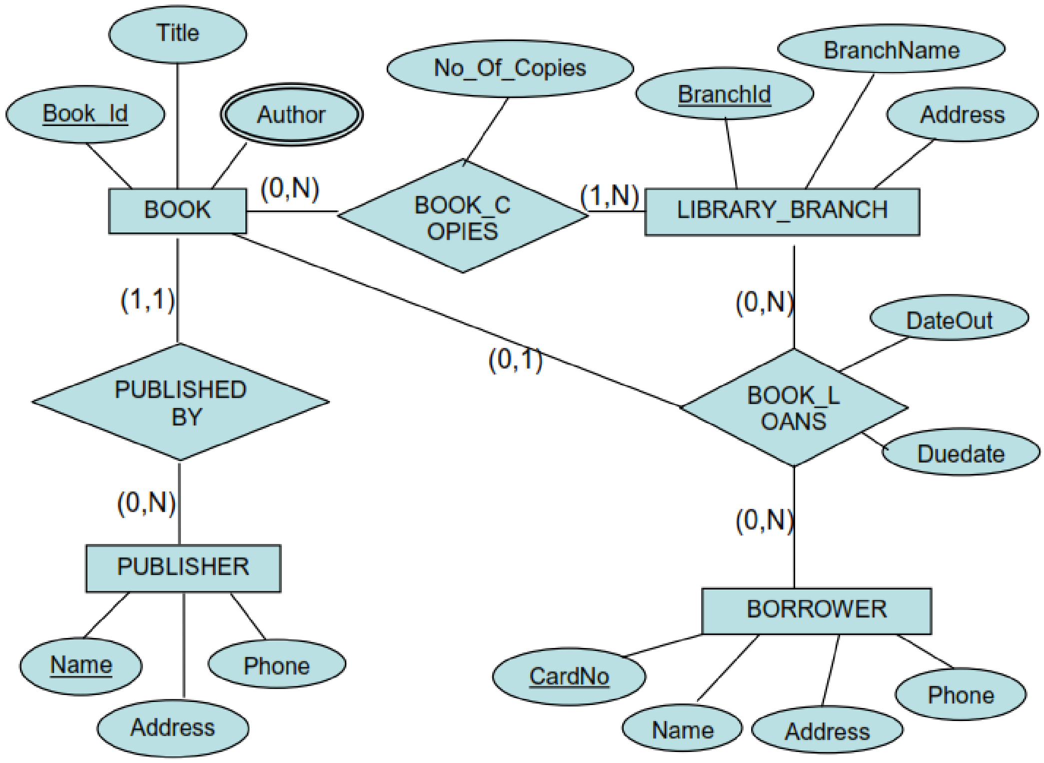
Y(c,d) = ______________________________

Z(e, f) = ______________________________

____

____

6. [10] Consider the following ER schema, which is used to keep track of books, borrowers, and book loans. Map this ER schema into relational schema. You are supposed to mention all keys properly.



7. [20] Consider the following database schema:

Sailors(sid, sname, rating, age)
Boats(bid, bname, color)
Reserves(sid, bid, day)

Write/complete the following queries in relational algebra on this database schema:

(a). [2] Find names of sailors who've reserved a red boat.

$\pi_{(sname)}((\sigma_{(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)}Boats)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)$

(b). [3] Find names of sailors who've reserved boat 103. (write in two ways)

Result ← _________((_________________ Reserves)____________________)

Result ← _________(__________________ Reserves____________________)

(c). [3] Find the name of sailors who've reserved a red or a green boat.[2]

T1 ← ______________________________________Boats

Result ← ____________(T1 _______________________________________)

(d). [3] Find the names of sailors who've reserved all boats.

T1 ← $\pi_{(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)}$(______________________________)

T2 ← $\pi_{(bid)}$(________________________________)

T3 ← ______________________________________

$Result \leftarrow \pi_{(sname)}($______________$*$ __________________$)$

(e). [3] Find the number of boats reserved on Monday.

T1(________, no_of_boats) ← ____________________________ (Reserves)

Result ← _________________(__________________________T1)

(f). [3] Find sailors who've reserved a red and a green boat.

T1 ← _________((_________________________________)* Reserves

T2 ← _________((_________________________________)* Reserves

$Result \leftarrow \pi_{(sname)}(($____$)$

(g). [3] Find the name of the sailor having the highest rating.

$T1(ratingA) \leftarrow \pi_{(rating)}($______________________________$)$

$Result \leftarrow \pi_{(sname)}(T1$____$)$