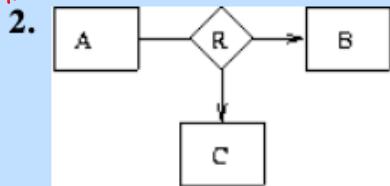


# Problems

Sunday, May 26, 2019      8:44 PM

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Let  $a$ ,  $b$ , and  $c$  be the numbers of entities in entity sets  $A$ ,  $B$ , and  $C$ , respectively. Let  $t$  be the number of triples in the relationship set for  $R$ . Which of the following is a possible combination of values for  $a$ ,  $b$ ,  $c$ , and  $t$ ?

- a)  $a=3, b=10, c=5, t=12$
- b)  $a=100, b=10, c=5, t=1000$
- c)  $a=100, b=10, c=100, t=1100$
- d)  $a=1, b=2, c=3, t=3$

Answer submitted: a)

For each  $\begin{Bmatrix} (A,B) \\ (A,C) \end{Bmatrix}$  pair, there's only one  $\begin{Bmatrix} C \\ B \end{Bmatrix}$ , so there're atmost  $\max\{a,b\}$  entities in  $R$ .

which means that we want  $ab \geq t$  and  $ac \geq t$ .

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3. Let  $R(ABCDEFGH)$  satisfy the following functional dependencies:

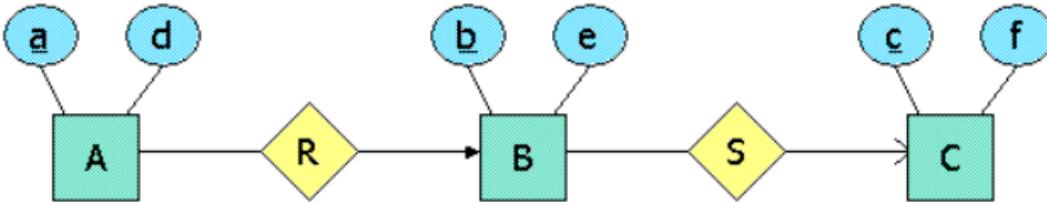
$$A \rightarrow B, CH \rightarrow A, B \rightarrow E, BD \rightarrow C, EG \rightarrow H, DE \rightarrow F.$$

Which of the following FD's is also guaranteed to be satisfied by  $R$ ?

- a)  $CGH \rightarrow BF$
- b)  $BCD \rightarrow FH$
- c)  $CEG \rightarrow AB$
- d)  $CDE \rightarrow AF$

Answer submitted: c)

☆☆  
 $\{CEG\}^+ = \{CEGH\}^+ = \{ABCEGH\}$ .



Based on the above ER diagram, which of the following entity set cardinalities is valid?

- a)  $|A| = 1; |B| = 1; |C| = 0$
- b)  $|A| = 1; |B| = 10; |C| = 0$
- c)  $|A| = 0; |B| = 10; |C| = 0$
- d)  $|A| = 0; |B| = 1; |C| = 10$

→ the corresponding attr it points to can be null  
→ can't be null. So  $|C| \neq 0$ .  
Or ( $|B|=0$  and  $|C|=0$ )

Answer submitted: d)

Consider the E/R diagram above, and suppose that a1 and a2 are entities of entity set A, b1 and b2 are entities of set B, and c1 and c2 are entities of set C. The arrows limit the possible relationship sets for R and S. Describe the limitations on these relationship sets. Then, confirm your understanding by identifying which of the following relationships sets for R and S are possible according to the diagram.

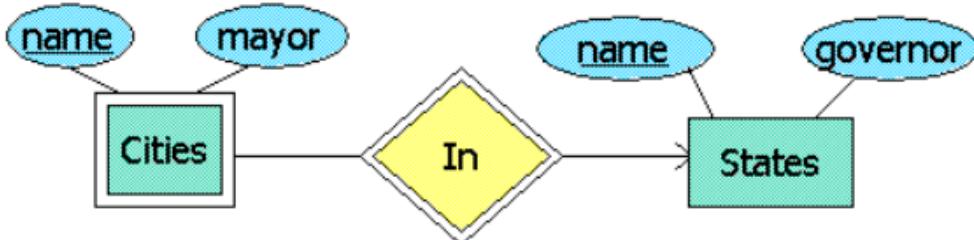
- a)  $R = \{(a1,b1), (a2,b2)\}; S = \{(b1,c1), (b2,c1), (b1,c2)\}$
- b)  $R = \{(a1,b1), (a2,b1)\}; S = \{(b1,c2)\}$
- c)  $R = \{(a2,b1), (a2,b2)\}; S = \{(b1,c1), (b2,c2)\}$
- d)  $R = \{(a1, b2), (a2,b1)\}; S = \{(b1,c1), (b2, c1)\}$

Answer submitted: d)

As described above.

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8.



Convert this E/R diagram to relations, resolving the dual use of the attribute "name" in some reasonable way. Then confirm your correct translation by indicating which of the

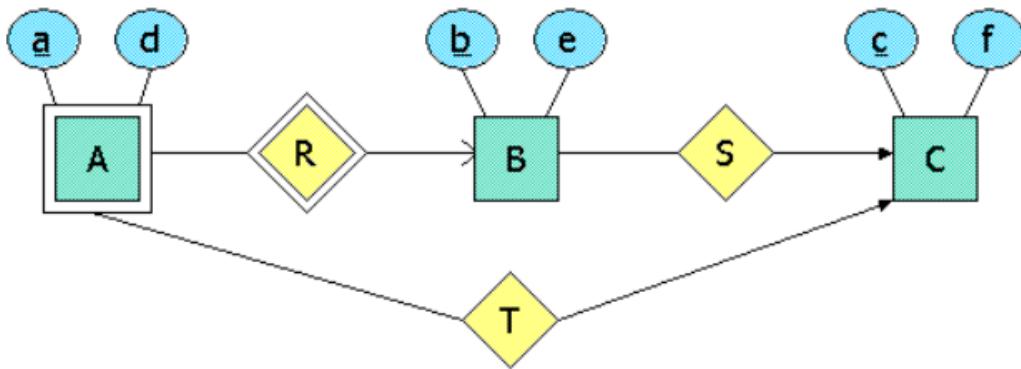
Which one of the database schemas below is the most reasonable translation from the E/R diagram above into relations?

- a) Cities(cname, sname, mayor), States(sname, gov)
- b) Cities(cityName, mayor), States(name, governor)
- c) Cities(cname, mayor), States(sname, gov)
- d) Cities(name, name, mayor), States(name, governor)

Answer submitted: a)

Weak entity set.

9.



Convert the above E/R diagram to relations in the normal manner, and then identify which of the following is NOT a relation schema.

- a) C(c,f)
- b) A(a,b,d)
- c) S(b,c)
- d) B(a,b,e)

Answer submitted: d)

7. Let R(ABCD) be a relation with functional dependencies

$$A \rightarrow B, C \rightarrow D, AD \rightarrow C, BC \rightarrow A$$

Which of the following is a lossless-join decomposition of R into Boyce-Codd Normal Form (BCNF)?

- a) {AB, AC, AD, BCD}
- b) {AB, AC, AD, BC, BD, CD}
- c) {AB, AD, CD}
- d) {AB, AD, BC, CD}

Answer submitted: b)

BCD is not a BCNF.

Step I:

$$\left. \begin{array}{l} \{AB\}^+ = \{AB\} \\ \{AC\}^+ = \{ABCD\} \\ \{AD\}^+ = \{ABCD\} \\ \{BC\}^+ = \{ABCD\} \\ \{BD\}^+ = \{BD\} \\ \{CD\}^+ = \{CD\}. \end{array} \right\}$$

They are BCNF.

Step II: chase

a	b	c	d
a	b	c1	d1
a	<del>b1</del> b	c	<del>d2</del> d
a	<del>b2</del> b	c2	d
a1	b	c	<del>d3</del> d
a2	b	c3	d
a3	b3	c	d

then apply FD:

$$A \rightarrow B$$

$$C \rightarrow D$$

find (a,b,c,d)  $\in R$ .

'Yes they're lossless.