

Homework 9

Due December 3, 2013

CMSC 203

1. Section 9.1, Exercise 22

Must an asymmetric relation also be antisymmetric? Must an antisymmetric relation be asymmetric? Give reasons for your answers.

2. Section 9.2, Exercise 8

The 4-tuples in a 4-ary relation represent these attributes of published books: title, ISBN, publication date, number of pages.

- a) What is the likely primary key for this relation?
- b) Under what conditions would (title, publication date) be a composite key?
- c) Under what conditions would (title, number of pages) be a composite key?

3. Section 9.2, Exercise 18

How many components are there in the n -tuples in the table obtained by applying the join operator J_3 to two tables with 5-tuples and 8-tuples, respectively?

4. Section 9.2, Exercise 20

Show that if C_1 and C_2 are condition that elements the relation R may satisfy, then $s_{C_1 \wedge C_2}(R) = s_{C_1}(s_{C_2}(R))$

5. Section 9.2, Exercise 28 a

What are the operations that correspond to the query expressed using this SQL statement?

SELECT Supplier, Project FROM Part_needs, Parts_inventory WHERE Quantity $\leq$ 10

Express which part represent which operations, and explain your answer.

6. Section 9.3, Exercise 2

Represent each of these relations on $\{1, 2, 3, 4\}$ with a matrix (with the elements of this set listed in increasing order)

- a) $\{(1, 2), (1, 3), (1, 4), (2, 3), (2, 4), (3, 4)\}$
- b) $\{(1, 1), (1, 4), (2, 2), (3, 3), (4, 1)\}$
- c) $\{(1, 2), (1, 3), (1, 4), (2, 1), (2, 3), (2, 4), (3, 1), (3, 2), (3, 4), (4, 1), (4, 2), (4, 3)\}$
- d) $\{(2, 4), (3, 1), (3, 2), (3, 4)\}$

7. Section 9.3, Exercise 4

List the ordered pairs in the relations on $\{1, 2, 3, 4\}$ corresponding to these matrices (where the rows and columns correspond to the integers listed in increasing order)

a)
$$\begin{bmatrix} 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$$

b)
$$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$$

c)
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

8. Section 9.3, Exercise 8

Determine whether the relations represented by the matrices in Problem 2 (Exercise 4 in the book) are reflexive, symmetric, antisymmetric, and/or transitive. List yes or no for each one of the options, and support your answer.

9. Section 9.3, Exercise 21

Draw the directed graph representing each of the relations from Problem 2 (Exercise 4 in the book).