Exercises 5

软件工程一班 张逸松 57 号

October 22, 2019

1.2

a) It's not reflexive, not symmetric, not antisymmetric, transitive.

b) It's reflexive, symmetric, not antisymmetric, transitive.

c) It's not reflexive, symmetric, not antisymmetric, not transitive.

d) It's not reflexive, not symmetric, antisymmetric, transitive.

e) It's reflexive, symmetric, antisymmetric, transitive.

f) It's not reflexive, not symmetric, not antisymmetric, not transitive.

1.5

If $R = \emptyset$, then the hypotheses of the conditional statements in the definitions of symmetric and transitive are always false, so that definitions are always true. If $S = \emptyset$, the no element in S, so R without any (a, a) also is the reflexive.

1.14

a) $\{(a, b) \mid a\ is\ required\ to\ or\ has\ read\ book\ b.\}$

b) $\{(a, b) \mid a\ is\ required\ to\ and\ has\ read\ book\ b.\}$

c) $\{(a, b) \mid a\ is\ required\ to\ but\ has\ not\ read\ book\ b\ or\ has\ read\ book\ b\ but\ is\ not\ required\ to\ read.\}$

d) $\{(a, b) \mid a\ is\ required\ to\ but\ has\ not\ read\ book\ b.\}$

d) $\{(a, b) \mid a\ has\ read\ book\ b\ but\ is\ not\ required\ to\ read.\}$

2.5

a) Social Security numbers.

b) There are no two people with the same name who happen to have the same street address.

c) There are no two people with the same living in the same street address in a city.

2.11

Both sides of the equation select the n-tuples with C_1 and C_2, so the order does not affect result.

2.13

Both sides of the equation leaving the $i_1th, i_2th \dots i_mth$ components with m-tuples from n-tuples in either R or S.

3.8

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

3.12

$\{(a, a), (a, b), (a, c), (b, a), (b, b), (b, c), (c, a), (c, b), (d, d)\}$

3.16

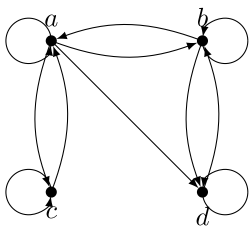
Step 1 M_R represents the relation R.

Step 2 If $M_R^{[n-1]}$ represent the relation R^{n-1}, beacause of $M_R^{[n-1]} \cdot M_R = M_R^{[n]}$ and $R^{n-1} \cdot R = R^n$, $M_R^{[n]}$ represents R^n.

4.2

$\{(a, b) \mid a \textit{ divides } b \textit{ or } b \textit{ divides } a\}$

4.4



4.7

The symmetric closure of R is $R \cup R^{-1}$, as $M_{R \cup R^{-1}} = M_R \vee M_R^t$.

4.9

a) $\{(1, 1), (1, 5), (2, 3), (3, 1), (3, 2), (3, 3), (3, 4), (4, 1), (4, 5), (5, 3), (5, 4)\}$

b) $\{(1, 1), (1, 2), (1, 3), (1, 4), (2, 1), (2, 5), (3, 1), (3, 3), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (4, 4), (5, 1), (5, 3), (5, 5)\}$

f) $\{(a, b) \mid a, b \in [1, 5] \cap \mathbb{Z}\}$