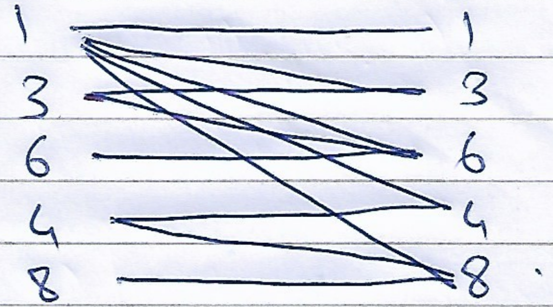
Discrete Structures Tutorial-4

PG-43. Jaynam Modi. G3. August 7th 2020.

1. $R = \{(a,b) \mid a \text{ divides } b\}$ on $\{1,3,4,6,8\}$

$R = \{(1,1), (1,3), (1,4), (1,6), (1,8), (3,3), (3,6), (4,4), (4,8), (6,6), (8,8)\}$

R	1	3	4	6	8
1	x	x	x	x	x
3		x		x	
4			x		x
6				x	
8					x



2\. The converse relation, or transpose, of a binary relation is the relation that occurs when the order of the elements is switched in the relation.

given, $R = \{(a,b) \mid \text{state } a \text{ borders state } b\}$.

thus, $R^c = \{(b,a) \mid (a,b) \in R\}$

Since it is clear that if state a borders state b then state b also borders state a because they share a common border,

we can say that for $(a,b) \in R$, ~~$(b,a) \in R$~~

$(b,a) \in R$ as well.

thus, $R^c = \{(b,a) \mid (a,b) \in R\} = R$

i.e. $\underline{R^c = R}$

3\. $R = \{(1,1), (1,2), (1,3), (2,3), (2,4), (3,1), (3,4), (3,5), (4,2), (4,5), (5,1), (5,2), (5,4)\}$.

~~$R^3 = R \circ R \circ R$ $(R \circ R)$~~

$R^3 = R \circ R^2 = R \circ R \circ R$

$= \{(1,1), (1,2), (1,3), (1,4), (1,5), \cancel{(1,6)},$
$(2,1), (2,2), (2,3), (2,4), (2,5),$
$(3,1), (3,2), (3,3), (3,4), (3,5),$
$(4,1), (4,2), (4,3), (4,4), (4,5),$
$(5,1), (5,2), (5,3), (5,4), (5,5)\}.$

4. (a) SELECT Supplier, Project → <u>Projection</u>
FROM Part_needs, Part_inventory → <u>Join</u>
WHERE Quantity $\leq$ 10. → <u>Selection</u>

(b) The output of the given SQL query will be:

Supplier.	Project.
23	1
23	3
23	4
31	3
32	4
33	1

5. a $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

i.e.

R_1	1	2	3
1	1	0	1
2	0	1	0
3	1	0	1

thus, $R_1 = \{(1,1), (1,3), (2,2), (3,1), (3,3)\}$

b. similarly,

$R_2 = \{(1,2), (2,2), (3,2)\}$

c. and

$R_3 = \{(1,1), (1,2), (1,3), (2,1), (2,3), (3,1), (3,2), (3,3)\}$

Page No.:

6. For a relation to be considered an equivalence relation, it should be :

reflexive i.e $(a,a) \in R$

symmetric i.e. $\forall (a,b) \in R, \ (b,a) \in R$.

& transitive, i.e. $\forall \{(a,b),(b,c) \in R, \ (a,c) \in R$.

(a) $\{(0,0), (1,1), (2,2), (3,3)\}$

since the set satisfies all three conditions mentioned above. it classifies as an equivalence relation.

(b) $\{(0,0), (1,1), (1,2), (2,1), (2,2), (3,3)\}$.

since this set is reflexive, symmetric & transitive, this is also an equivalence relation.