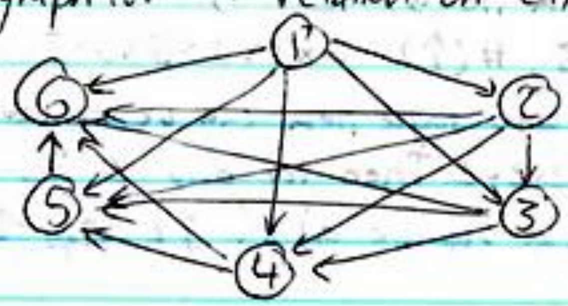
CSC 2259 Crib Notes

Lecture 1 PM

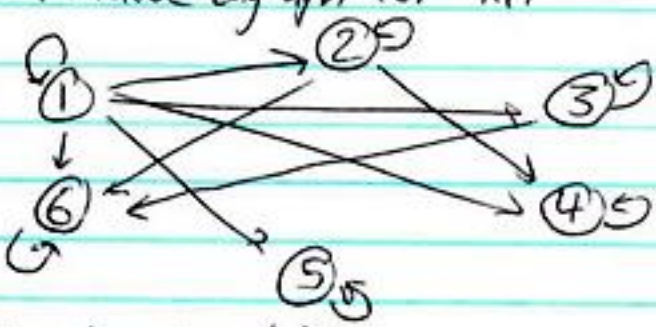
- idea of relations ($>, <, =, \geq, \leq, \neq, \ldots$)
- set of x less y : $\{(x,y) : x \in S, y \in S, x<y\} \subseteq S \times S$
- $S \times S$ (cartesian product) (multiplication sets)
- example digraph for "<" relation on $\{1,2,3,\ldots,6\}$



- matrix representation of above $\longrightarrow$

$$\begin{array}{c|cccccc} & 1 & 2 & 3 & 4 & 5 & 6 \\ \hline 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 2 & 0 & 0 & 1 & 1 & 1 & 1 \\ 3 & 0 & 0 & 0 & 1 & 1 & 1 \\ 4 & 0 & 0 & 0 & 0 & 1 & 1 \\ 5 & 0 & 0 & 0 & 0 & 0 & 1 \\ 6 & 0 & 0 & 0 & 0 & 0 & 0 \end{array}$$

- example of reflexive digraph for $x|y$

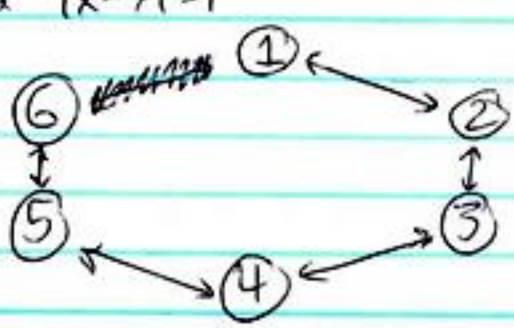


matrix

111111
010101
001001
000100
000010
000001

- reflexive property of relations
  - each x is related to itself (for every x)
  - $(x,x) \in R$
  - xRx

- $\#(\text{relations on } S) = 2^{n^2}$, $\#(\text{reflexive relations}) = 2^{n^2-n}$
- symmetric relations R (on S)
  - for each $x \neq y$, if $(x,y) \in R$ then $(y,x) \in R$
- double-sided $|x-y|=1$



Lecture 2 PM

- anti-symmetric ($\neq$ non-symmetric)
  - you cannot have both (x,y) and (y,x) ever
  - ex: $x<y$, $x \leq y$ are anti-symmetric
- # (antisym on n items) $= 2^n \times 3^{C(n,2)}$
  - ex: if $n=3$, $\#(\uparrow) = 2\times2\times2\times3\times3\times3$

  for $\{a,b,c\}$, any single item can be reflexive or not reflexive, so $2\times2\times2$. Then for any 2 items a,b, if there is $(a \quad b)$, $(a\to b)$, $(b \leftarrow a)$ ✓. If $(a \rightleftarrows b)$, no. Hence, $3\times3\times3$.