ESE CHEATSHEET

Symbols for propositional logic

$\neg$ - negation $\wedge$ - AND $\vee$ - OR $\rightarrow$ - Implication ($T \rightarrow F = F$; else T)

$\leftrightarrow$ - Biconditional (XNOR) $\oplus$ - XOR

For $p \rightarrow q$

$q \rightarrow p$ - converse

$\neg p \rightarrow \neg q$ - inverse

$\neg q \rightarrow \neg p$ - contrapositive

Confusing truth tables

P	Q	$P \rightarrow Q$	$P \leftrightarrow Q$	$P \oplus Q$
0	0	1	1	0
0	1	1	0	1
1	0	0	0	1
1	1	1	1	0

Steps for Warshall's Algorithm

1) Use W_{n-1} to find W_n
2) Check $(n+1)^{th}$ row & column in W_n
3) Add ones at the "intersection" of ones in the rows & columns selected
4) Move to next W

Types of Relations

Reflexive $(a,a) \in R$ for all a

Transitive (a,b) & $(b,c) \in R$ & $(a,c) \in R$

Symmetric (a,b) & $(b,a) \in R$

Complement of element in lattice (say element a)

If a' is complement then

$a \wedge a' = 0$ & $a \vee a' = 1$

Distributive lattice $a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$

$a \vee (b \wedge c) = (a \vee b) \wedge (a \vee c)$

OR each element has at most one complement

Complemented lattice — Each element has at least 1 complement

Injective (one-one) Surjective (onto) & Bijective (both)

PIGEONHOLE THEOREM

'n' things, 'm' boxes then at least one box has $\left(\left(\frac{n-1}{m}\right)+1\right)$ things

Euler All edges Hamilton All vertices

Isomorphic Graph Check!

- Same no of vertices
- Same no of edges
- Same no of degrees
- Adjacency/what connects to what

Legend

Closure - Cl
Commutative - Co
Associative - A
Identity - Id
Inverse - In

Algebraic System - Cl
Semi-group - Cl, A
Monad - Cl, A, Id
Group - Cl, A, Id, In
Abelian group - Cl, A, Id, In, Co