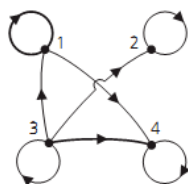


Discrete Mathematics (2012 Spring) Midterm II

1. (20 points) For each of the following statements, determine and explain (required) whether it is correct or not.
 - (1). Let (A, R) be a poset. If (A, R) is a lattice, then it is a total order.
 - (2). The subset relation is a partial order relation.
 - (3). The proper subset relation is a partial order relation.
 - (4). Let $A = \{1, 2, 3, 4, 5, 6, 7\}$, there is an equivalence relation R on A with $|R|=8$.
 - (5). String 01011 is in the language $\{00\}^* \{01\}^+ \{1\}^*$ and is also in the language $\{01\}^* \{0\}^* \{11\}^* \{1,0\}^*$.
2. (10 points) (a) How many two-factor ordered factorizations, where each factor is greater than 1, are there for 156,009 ($3 \cdot 7 \cdot 17 \cdot 19 \cdot 23$)? (b) In how many ways can 156,009 be factored into two or more factors, each greater than 1 and the order of the factors is relevant?
3. (10 points) If $A = \{w, x, y, z\}$, determine the number of relations on A that are (a) reflexive and symmetric, (b) antisymmetric and contain (x,y) , (c) symmetric and antisymmetric, (d) equivalence relations that determine more than two (include two) equivalence classes, (e) reflexive and symmetric but not transitive.
4. (15 points) The directed graph G for a relation R on set $A = \{1, 2, 3, 4\}$ is shown in the following graph. (a) Please verify that (A, R) is a poset. (b) Draw its Hasse diagram. (c) Topologically sort (A, R) . (d) How many more directed edges are needed in the following graph to extend (A, R) to a total order? (e) How many more directed edges are needed in the following graph to extend R to an equivalence relation?



$m \backslash n$	$S(m, n)$					
	1	2	3	4	5	6
1	1					
2	1	1				
3	1	3	1			
4	1	7	6	1		
5	1	15	25	10	1	
6	1	31	90	65	15	1

Table of Stirling number of the second kind