PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Second Exam A **DISCRETE STRUCTURES** **15–12–2013**

Part 1 Each problem is worth 2 points. Circle one answer.

1) The sequence 3, 4, 7, 12, 19, 28, ... is given which function?

a) $S(n) = 6n + 3$ b) $S(n) = n^2 + 3$
c) $S(n) = 3n + 6$ d) $S(n) = n^2 + 6$

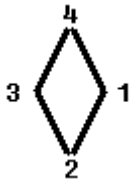
2) Let A = {1, 2, 3, 4} and R = {(a,b) | a + b > 3}. Which one is correct?

a) Reflexive (F); Symmetric (T); Anti-symmetric (F); Transitive (F)
b) Reflexive (T); Symmetric (T); Anti-symmetric (F); Transitive (T)
c) Reflexive (T); Symmetric (F); Anti-symmetric (T); Transitive (T)
d) Reflexive (F); Symmetric (F); Anti-symmetric (T); Transitive (T)

3) Which relation is an equivalence relation?

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

4) Change the Hasse diagram to matrix.



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

Part 2 Each problem is worth 4 points. Write complete solution.

5) Find the formula for the recursive sequence $S(n) = 3\,S(n-1) + 10\,S(n-2)$ given that $S(0) = 3$ and $S(1) = 1$.

6) Prove the formula for all integers $n \geq 1$ using induction.

$$1 + 4 + 16 + \ldots + 4^{n-1} = \frac{4^n - 1}{3}$$

7) Let R = {(1,3), (2,1), (3,4), (4,1)}. Find the matrix for the transitive closure.

--Amin Witno