PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Second Exam A **DISCRETE STRUCTURES** **3–1–2008**

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

1) Suppose that A = {1, 2, 3, 4, 5} and B = {3, 4, 5, 6, 7}.
Which set is equal to {1, 2} ?
a) B – A b) (A + B) – B c) (A ∩ B) + B d) (A ∪ B) – A

2) There are 8 Faculties in Philadelphia University. What is the minimum number of students so that at least 18 are in the same faculty?
a) 113 b) 121 c) 129 d) 137

3) How many different permutations from the set {A, C, E, N, T} which do not contain the word TEN ?
a) 114 b) 110 c) 60 d) 96

4) Let A = {2,3,5,7,8}. Which relation is an equivalence relation?
a) R = {(a,b) | a < 2b} b) R = {(a,b) | a mod 3 = b mod 2}
c) R = {(a,b) | b mod a = 0} d) R = {(a,b) | a + b is even}

5) Which relation is a total order relation?

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

6) Let A = {1, 2, 3, 4} and R = {(1,2), (2,3), (2,4), (3,3), (4,1)}. Find R^2.
a) {(1,3), (1,4), (2,1), (2,3), (3,3), (4,2)}
b) {{1,3), (1,4), (2,3), (4,2)}
c) {(1,3), (1,4), (2,1), (3,2), (4,2)}
d) {(1,3), (1,4), (2,1), (3,4), (4,2)}

Part 2 Each problem is worth 4 points. Write complete solutions for full credit.

7) How many positive integers ≤ 1000 which are not multiples of 6 or 4 or 14?

8) Let A = {3, 6, 9, 12, 36} and R = { (a, b) | b mod a = 0 } ⊆ A x A.
a) Find the elements of R and draw the digraph.
b) Prove that R is a partial order relation and draw the Hasse diagram.

-Amin Witno