Second Exam A   **DISCRETE STRUCTURES**   **10–5–2007**

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

1)   Suppose $B \subseteq A$. Then $A \oplus B =$
        a) $B - A$ b) $A - B$ c) $A \cap B$ d) $A \cup B$

2)   There are 6 chapters in Discrete Mathematics. What is the minimum number
        of questions in the exam so that at least 12 come from the same chapter?
        a) 67   b) 78   c) 73   d) 72

3)   How many different permutations can be formed using the elements of the
        multiset $\{A, B, B, C, B, B, A\}$?
        a) 840   b) 420   c) 105   d) 210

4)   Let $A = \{2,3,5,7\}$ and $R = \{(a,b) \mid a < 2b\}$. Then R is
        a) reflexive and symmetric   b) anti-symmetric and transitive
        c) reflexive and transitive   d) reflexive only

5)   An equivalence relation is represented by the following zero-one matrix.

$$\begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

        Find the equivalence classes.
        a) {1, 2, 3, 5}, {4}   b) {1, 3}, {2, 5}, {4}
        c) {1, 3, 4}, {2, 5}   d) {1, 3, 4}, {2}, {5}

Part 2 This part is worth 10 points. Write complete solutions for full credit.

6)   Let $A = \{1, 2, 3, 4\}$. Give an example of $R \subseteq A \times A$ with the given properties.
        a) reflexive (F) symmetric (T) anti-symmetric (F) transitive (T)
        b) reflexive (F) symmetric (F) anti-symmetric (F) transitive (F)

7)   How many positive integers ≤ 1000 which are not multiples of 8 or 9 or 12?

8)   Let $A = \{2, 4, 6, 12, 24\}$ and $R = \{(a, b) \mid a \text{ divides } b\} \subseteq A \times A$.
        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