

COT 3100 Discrete Mathematics

Homework 4

This homework is **due on Friday, 16th April, 2010**

Problem 1

- (a) (7 pts) How many permutations of MISSISSIPPI have no consecutive vowels?
- (b) (8 pts) An ascending number is a number where each of the digits are distinct and are contained in the number in ascending order. For example, 145 and 24679 are ascending numbers and no ascending numbers start with the digit 0. How many ascending numbers are there total?

Problem 2

- (a) (8 pts) How many different terms are there in the expansion of $(x_1 + x_2 + \cdots + x_m)^n$ after all terms with identical sets of exponents are added?
- (b) (7 pts) Find the coefficient of $x^2y^2z^6$ in $(x + y + z)^{10}$.

Problem 3

- (a) (8 pts) Let $A = \{1, 2, 3, 4, 5\}$ and R be a binary relation over A such that $R = \{(1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (3, 1), (3, 3), (4, 2), (5, 1), (5, 3), (5, 5)\}$. Is R reflexive, symmetric, anti-symmetric, or transitive? Justify each answer.
- (b) (6 pts) Let R and S be binary relations over set Z . Prove or disprove: if R is transitive and S is transitive, then $R \circ S$ is also transitive.
- (c) (6 pts) For positive integers a and b , define $(a, b) \in R$ if and only if $a^2 + b$ is even. Prove that R is an equivalence relation.