Homework 6, part 2

November 16, 2009

1.

a. Write down the generating function for the sequence $s_0 = 1, s_1, s_2, ...$,
where s_n is the number of strings of length n composed of the symbols
A, B, C, D, such that the string is in alphabetical order. For example, the
strings of length 4 in the language include $AAAA, BBBB, CCCC, DDDD, ABBB, ACCC, ADDD$
I would like you to do this by first finding the Finite State Machine that generates these strings.

b. Then, work out a formula for the number of strings in the language
having length n.

2. Let $f(n)$ denote the number of partitions of n such that the numbers
in each partition occur at most twice, and let $g(n)$ denote the number of
partitions of n where no number in the partition is divisible by 3. Prove that
$f(n) = g(n)$ for all $n \geq 1$ using generating functions.