



FINAL EXAM.; MATH 211

FALL 2002; FEB. 5; 11:30 A.M.-1:30 P.M.

Instructions:

- Let N , P and Z be the sets natural numbers, positive integers and integers respectively.
- The examination consists of **five** independent questions each of which consists of three or four partial questions.
- The grade allocated to each question appears next to the question.
- The total grade is 100.



missing 1 page (2/20)

4. (a) Give an explicit formula for s_n if $s_0 = 2$, $s_1 = 1$, and $s_n = s_{n-1} + 2s_{n-2}$ for $n \geq 2$. (6 points)

(b) Let $\Sigma = \{a, b\}$ and s_n , $n \in \mathbf{N}$, be the number of words of length n not containing the string aa . Find a recurrence formula for s_n . (6 points)

(c) Give an explicit formula for s_n if $s_1 = 1/6$ and $s_{2n} = 2s_n + n^3$ for $n \in \mathbf{P}$; and show that $s_n = \Theta(n^3)$. Hint: $s_{2^m} = 2^m[s_1 + 1/2 \sum_{i=0}^{m-1} f(2^i)/2^i]$. (6 points)

5. (a) A group of 60 persons were surveyed. Twenty-six like pizza, thirty-two like hamburgers, thirty like shawarma, fourteen like both pizza and hamburgers, seven like both pizza and shawarma, ten like hamburgers and shawarma, and two like all three. How many dislike all three? (6 points)

(b) A class of 200 students votes on a date for an exam. Each votes for just one of the five working days of the week. How many different ways may they vote? (6 points)

(c) Nine students enter one elevator in the basement of College Hall. Each exits at floor 1, 2, 3, 4 or 5. How many different ways can this happen? (6 points)

(d) A class of 20 students is divided into 4 mutually disjoint study groups of equal size 5 students. How many different ways can this happen? (6 points)

Once Again, May You Have Fun And Have It More Abundantly