Department of Mathematics
Carnegie Mellon University

21-228 Discrete Mathematics: Section 1
Test 2

Name:_______________________________________

Problem	Points	Score
1	33	
2	33	
3	34	
Total	100	

Q1: (33pts) Solve the following linear recurrence:

$$u_n - 4u_{n-1} + 4u_{n-2} = \binom{n}{2} 2^n + 1, \qquad\qquad n \geq 2.$$

$u_0 = u_1 = 0.$

Q2: (33pts) Let $F = \{f : [n] \to [m]\}$. If $f \in F$ and $x \in [m]$ let $\nu_f(x)$ denote the number of $y \in [n]$ such that $f(y) = x$.
Use Inclusion-Exclusion to find an expression for the number of $f \in F$ satisfying $\nu_f(x) \neq 1$ for all $x \in [m]$.

Q3: (34pts) Let b_n denote the number of 0/1 strings of length n which do not contain 1101 as a substring. Find a recurrence for b_n.
[Hint: divide strings according to where the last zero ocurs.]