Indian Institute of Information Technology Vadodara
MA 101: Introduction to Discrete Mathematics
Tutorial 8

1. Find the solution of the recurrence relation $a_n = 2a_{n-1} + 2n^2$ with initial condition $a_1 = 4$.

2. Find all solutions of the recurrence relation $a_n = 7a_{n-1} - 16a_{n-2} + 12a_{n-3} + n4^n$ with $a_0 = -2, a_1 = 0$, and $a_2 = 5$.

3. Find $f(n)$ when $n = 3^k$, where f satisfies the recurrence relation $f(n) = 2f(n/3) + 4$ with $f(1) = 1$.

4. Use generating functions to find an explicit formula for the Fibonacci numbers.

5. Use generating functions to solve the recurrence relation $a_k = 2a_{k-1} + 3a_{k-2} + 4^k + 6$ with initial conditions $a_0 = 20, a_1 = 60$.

6. Use generating functions to find the number of ways to make change for Rs 100 using notes of Rs 10, 20, 50.

7. Find a recurrence relation and generating function for the number of ways that the sum n can be obtained when a die is rolled repeatedly and the order of the rolls matters.

8. Exponential generating function for the sequence $\{a_n\}$ is the series: $\sum_{i=0}^{\infty} \frac{a_n}{n!} x^n$. Note that $e^x = \sum_{i=0}^{\infty} \frac{1}{n!} x^n$.
   Find a closed form for the exponential generating function for the sequence $\{a_n\}$, where a) $a_n = n$; b) $a_n = n(n-1)$