Indian Institute of Technology Jodhpur

CS112 Discrete Mathematics

Assignment 1

Generating Functions

1. Using generating functions, how can we represent the number of ways to roll a k (where $1 \leq k \leq 3 * 4 = 12$) given three tetrahedral dice whose faces are labelled 1, 2, 3, and 4?

2. For each infinite sequence suggested below, give its generating function in closed form, i.e., not as an infinite sum. (Use the most obvious choice of form for the general term of each sequence.)

   - $1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, \ldots$
   - $1, 2, 4, 8, 16, 32, \ldots$

3. . Find the coefficient on x^10 in each of the generating functions below

   - $(x^3 + x^5 + x^6)(x^4 + x^5 + x^7)(1 + x^5 + x^10 + x^15 + \ldots)$
   - $(1 + x^3)(x^3 + x^4 + x^5 + \ldots)(x^4 + x^5 + x^6 + \ldots)$
   - $\frac{1}{(1-x)^3}$
   - $\frac{1}{(1-5x^4)}$

4. Use generating functions to find the number of ways to partition n into odd parts.