Jaypee Institute Of Information Technology
ODD Semester 2022
Theoretical Foundation of Computer Science(CI212)
Tutorial - 6

Topic: Induction and Recurrence

Ques 1: Prove that $\mathbf{1^2 + 3^2 + 5^2 + \ ... + (2n + 1)^2 = \frac{(n+1)(2n+1)(3n+1)}{3}}$ whenever n is a nonnegative integer.

Ques 2: Prove that $2^n > n^2$ is n is an integer greater than 4.

Ques 3: Give the recursive definition of the following sequence $a_n \ \ n = 1,2,3$

a) $a_n = 6n$.
b) $a_n = 2n + 1$.
c) $a_n = 10^n$.
d) $a_n = 5$.

Ques 4: Find the solution for the recurrence relation

$$a_n = \begin{cases} 2 & if\ n = 0, \\ 7 & if\ n = 1, \\ a_{n-1} + 2a_{n-2} & otherwise. \end{cases}$$

Ques 5: Find the solution for the recurrence relation

$$\begin{aligned} x_n &= 6x_{n-1} - 9x_{n-2} \\ x_0 &= 2 \\ x_1 &= 3 \end{aligned}$$

Ques 6: Find the solution for the recurrence relation

$$\begin{cases} x_n = 10x_{n-1} - 25x_{n-2} + 8 \cdot 5^n \\ x_0 = 6 \\ x_1 = 10 \end{cases}$$