Recurrence Relations and Mathematical Induction:

Q No.1 Solve the following recurrence relations :

(i) $a_r - 7a_{r-1} + 10a_{r-2} = 0$, given that $a_o = 0$ and $a_1 = 3$.

(ii) $a_r - 4a_{r-1} + 4a_{r-2} = 0$, given that $a_o = 0$ and $a_1 = 6$.

(iii) $a_r - a_{r-1} - a_{r-2} = 0$, given that $a_o = 1$ and $a_1 = 1$.

(iv) $a_r - 2a_{r-1} + 2a_{r-2} - a_{r-3} = 0$, given that $a_o = 2$. $a_1 = 1$ and $a_2 = 1$.

Q No.2 Given that $a_o = 0$, $a_1 = 1$ and $a_2 = 4$ and $a_3 = 12$ satisfy the recurrence relation

$$a_r + C_1 a_{r-1} + C_2 a_{r-2} = 0$$

determine a_r .

Q No.3 The solution of recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 0$ where $a_0 = 2$ & $a_1 = 5$ is

a) $a_n = 2^n - 3^n$ b) $a_n = 2^n + 3^n$ c) $a_n = 2.3^n + 5.2^n$ d) $a_n = 3.2^n + 2.5^n$

Q No.4 The solution of recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = 0$ for $n \geq 2$, where $a_0 = 2$ & $a_1 = 5$ is

a) $a_n = 3^n + 4^n$ b) $a_n = 3^n - 4^n$ c) $a_n = 3^{n+1} - 4^n$ d) $a_n = 3^{n+1} + 4^n$

Q No.5 The solution of recurrence relation $a_n - 2a_{n-1} + a_{n-2} = 0$ with initial conditions $a_0 = 1$ & $a_1 = 2$ is

a) $a_n = n+2$ b) $a_n = 2^n + 1$ c) $a_n = n-1$ d) $a_n = n+1$

Q No.6 The solution of recurrence relation $a_n - 3a_{n-1} + 3a_{n-2} = 0$ where $a_0 = 0$ & $a_1 = 1$ & $a_2 = 2$ is

a) $a_n = n^2 + 1$ b) $a_n = n + 2n^2$ c) $a_n = n^2$ d) $a_n = n$

Q No. 7 Use mathematical induction to prove that sum of the first n odd positive integers is n^2.