

Cases for finding the solutions of recurrence equations based on the roots of the characteristic equation

Three cases exists for finding the solutions of recurrence equations based on the roots of the characteristic equation, who are follows:

Case 1: –roots of the characteristic equation are distinct:

If the roots of the characteristic equation, say r , are distinct ,then `r` fundamental solutions are possible. One can take any linear combination of the roots to get the general solution of a linear recurrence equation. One such solution is as follows:

$$t_n = c_1 r_1^n + c_2 r_2^n + \cdots + c_k r_k^n$$

Here, r_1, r_2, \dots, r_n are the roots of the characteristic equation. This equation can be solved with respect to the initial conditions of the recurrence equation to get the specific solution.
