

Discrete Assignment

EE1205 Signals and Systems

Kurre Vinay
EE23BTECH11036

Question 11.9.3.8: Find the sum to indicated number of term in each of the geometric progressions in $\sqrt{7}, \sqrt{21}, 3\sqrt{7}, \dots, n$ terms

Solution:

| variable | value | description |
|----------|-----------------------------------|---------------------------------------------------|
| $x(0)$ | $\sqrt{7}$ | first term of the geometric progression |
| r | $\sqrt{3}$ | common ratio of the geometric progression |
| $x(n)$ | $\sqrt{7}(3^n)u(n)$ | n^{th} term of the geometric progression |
| $y(n)$ | $\frac{x(0)(r^{n+1}-1)}{r-1}u(n)$ | Sum of the n term of the geometric progression |

TABLE I

INPUT PARAMETERS

$$X(z) = x(0) \left(\frac{1}{1 - rz^{-1}} \right), \quad |rz^{-1}| < 1 \quad (1)$$

$$y(n) = x(n) * u(n) \quad (2)$$

$$Y(z) = X(z) U(z) \quad (3)$$

$$= \sqrt{7} \left(\frac{1}{1 - \sqrt{3}z^{-1}} \right) \left(\frac{1}{1 - z^{-1}} \right), \quad |z| > \sqrt{3} \quad (4)$$

$$= \left(\frac{\sqrt{7}}{\sqrt{3} - 1} \right) \left(\left(\frac{\sqrt{3}}{1 - \sqrt{3}z^{-1}} \right) - \left(\frac{1}{1 - z^{-1}} \right) \right) \quad (5)$$

$$\frac{1}{1 - rz^{-1}} \xleftrightarrow{Z^{-1}} r^n u(n), \quad |z| > r \quad (6)$$

$$y(n) = \sqrt{7} \left(\frac{\sqrt{3}^{n+1} - 1}{\sqrt{3} - 1} \right) u(n), \quad |z| > \sqrt{3} \quad (7)$$

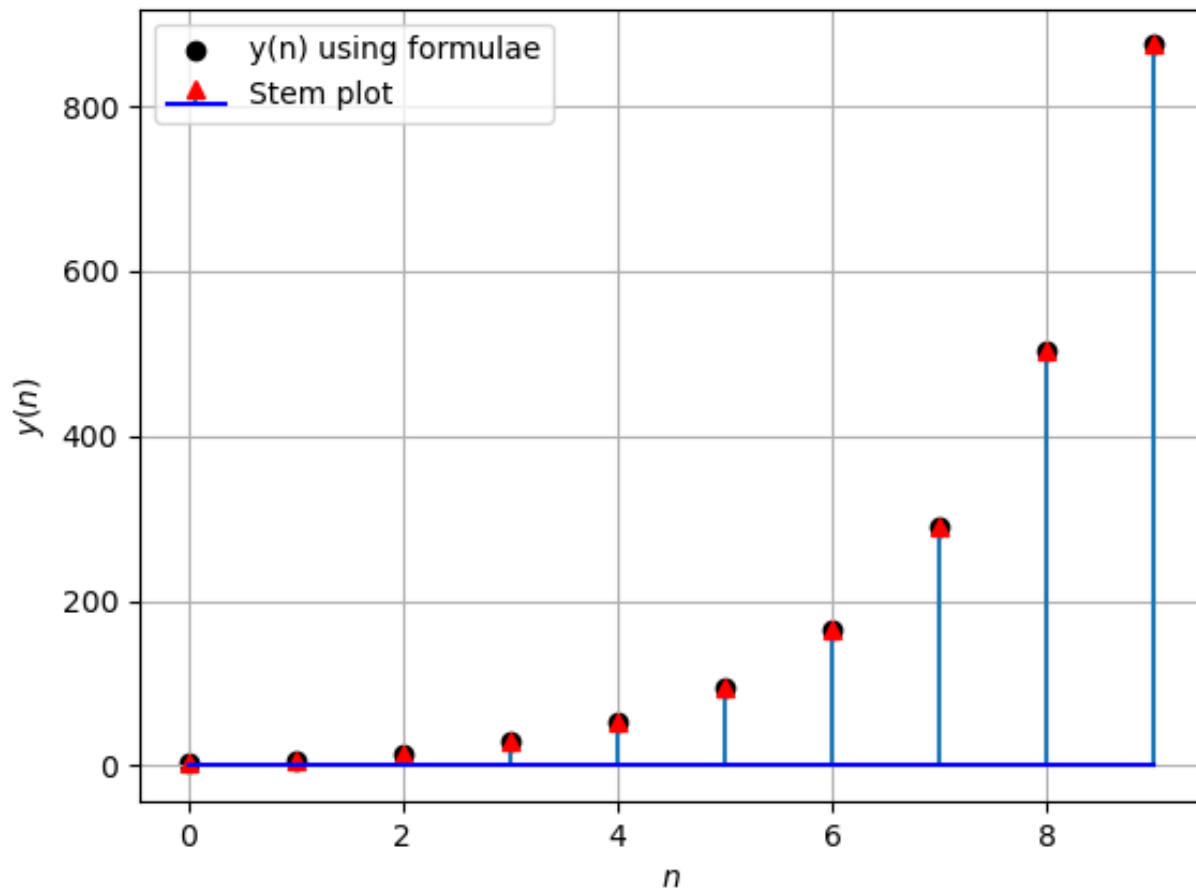


Fig. 1. STEM PLOT OF $y(n)$