EE23BTECH11047 - Deepakreddy P

17 If a, b, c, d are in G.P, prove that $(a^n + b^n), (b^n + c^n), (c^n + d^n)$ are in G.P and find the Z transform of General term of G.P.

Solution:

TABLE I
INPUT PARAMETERS

Symbol	Input value
$x(0)$	ar^0
$x(1)$	ar^1
$x(2)$	ar^2
$x(3)$	ar^3

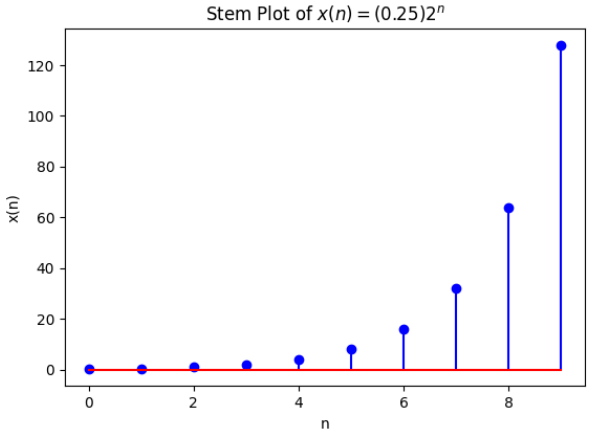

Fig. 1. Plot of x(n) vs n

$$\frac{(b^n + c^n)}{(a^n + b^n)} = \frac{\left(ar^1\right)^n + \left(ar^2\right)^n}{(ar^0)^n + (ar^1)^n} \tag{1}$$

$$= \frac{a^n r^n (1 + r^n)}{a^n (1 + r^n)} \tag{2}$$

$$= \frac{a^n r^{2n} (1 + r^n)}{a^n r^n (1 + r^n)} \tag{3}$$

$$= \frac{\left(ar^2\right)^n + \left(ar^3\right)^n}{(ar^1)^n + (ar^2)^n} \tag{4}$$

$$= \frac{(c^n + d^n)}{(b^n + c^n)} \tag{5}$$

Hence proved they are in in G.P

$$x(n) = x(0) r^n u(n) \tag{6}$$

$$X(z) = \frac{x(0)}{1 - rz^{-1}}, \quad |z| > |r| \tag{7}$$