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
$x(0)$	$x(0)r^0$
$x(1)$	$x(0)r^1$
$x(2)$	$x(0)r^2$
$x(3)$	$x(0)r^3$

$$= \frac{x(1)^n + x(2)^n}{x(0)^n + x(1)^n} \tag{1}$$

$$= \frac{\left(x(0)\, r^1\right)^n + \left(x(0)\, r^2\right)^n}{(x(0)r^0)^n + (x(0)\, r^1)^n} \tag{2}$$

$$= \frac{x(0)^n\, r^n\, (1 + r^n)}{x(0)^n\, (1 + r^n)} \tag{3}$$

$$= \frac{x(0)^n r^{2n}\, (1 + r^n)}{x(0)^n\, r^n\, (1 + r^n)} \tag{4}$$

$$= \frac{\left(x(0)\, r^2\right)^n + \left(x(0)\, r^3\right)^n}{(x(0)\, r^1)^n + (x(0)\, r^2)^n} \tag{5}$$

$$\implies \frac{x(1)^n + x(2)^n}{x(0)^n + x(1)^n} = \frac{x(2)^n + x(3)^n}{x(1)^n + x(2)^n} \tag{6}$$

Hence proved they are in in G.P

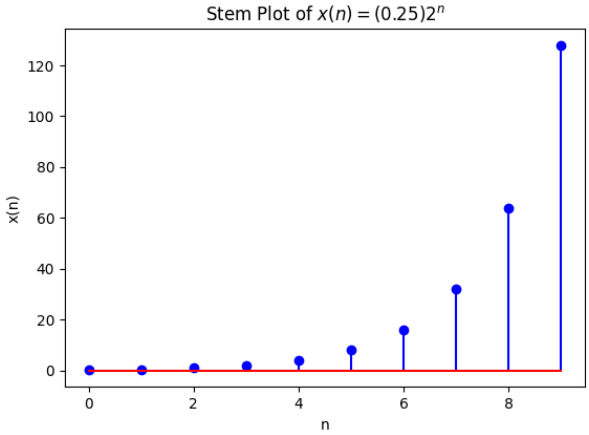

Fig. 1. Plot of x(n) vs n

$$x(n) = x(0)\, r^n u(n) \tag{7}$$

$$X(z) = \frac{x(0)}{1 - rz^{-1}}, \quad |z| > |r| \tag{8}$$