

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	value
a	ar^0
b	ar^1
c	ar^2
d	ar^3

$$\Rightarrow \frac{(b^n + c^n)}{(a^n + b^n)} = \frac{(c^n + d^n)}{(b^n + c^n)} \quad (1)$$

$$\Rightarrow \frac{(ar^1)^n + (ar^2)^n}{(ar^0)^n + (ar^1)^n} = \frac{(ar^2)^n + (ar^3)^n}{(ar^1)^n + (ar^2)^n} \quad (2)$$

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

$$\Rightarrow r^n = r^n \quad (4)$$

Hence proved they are in in G.P

$$x(n) = x(0)r^n u(n) \quad (5)$$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \quad (6)$$

$$= \sum_{n=0}^{\infty} ar^n z^{-n} \quad (7)$$

$$= \sum_{n=0}^{\infty} a(rz^{-1})^n \quad (8)$$

$$= \frac{a}{1 - rz^{-1}}, \quad |z| > |r| \quad (9)$$