

## 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

**Solution:**

TABLE I  
INPUT PARAMETERS

Symbol	Input value
$x(0)$	$a$
$x(1)$	$b$
$x(2)$	$c$
$x(3)$	$d$
$r$	$\frac{b}{a}$

$$r = \frac{b}{a} = \frac{c}{b} = \frac{d}{c}$$

From eq(1)

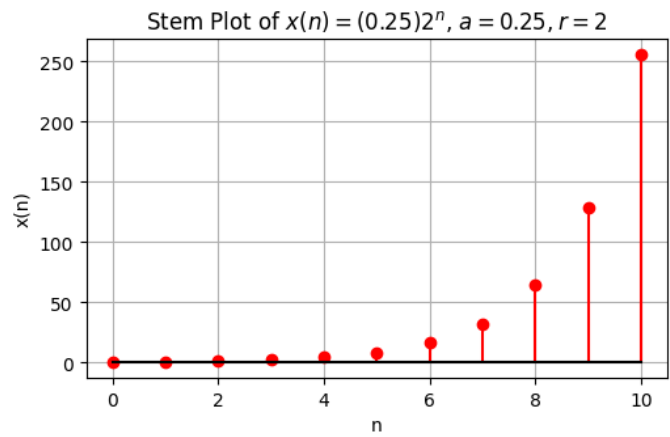
$$\begin{aligned} \frac{b^n + c^n}{a^n + b^n} &= \frac{(ar)^n + (ar^2)^n}{(a)^n + (ar)^n} \\ &= \frac{r^n ((ar)^n + (ar^2)^n)}{r^n ((a)^n + (ar)^n)} \\ &= \frac{(ar^2)^n + (ar^3)^n}{(ar)^n + (ar^2)^n} \\ &= \frac{c^n + d^n}{b^n + c^n} \end{aligned}$$

Hence proved they are in in G.P

$$x(n) = a \left( \frac{b}{a} \right)^n u(n) \quad (6)$$

$$X(z) = \frac{a}{1 - \frac{b}{a}z^{-1}}, \quad |z| > |r| \quad (7)$$

(1)



(2)

(3)

(4)

(5)

