EE3900 : Gate Assignment-3

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Download all latex-tikz codes from

https://github.com/Rahul27n/EE3900/blob/main/Gate_Assignment_3/Gate_Assignment_3.tex

1 QUESTION: GATE EC 2005 Q.85

A non-zero sequence $x(n)$ is given by:

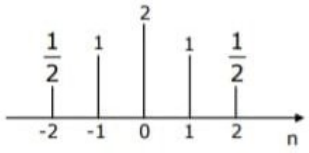

Fig. 0: $x(n)$

The sequence

$$y(n) = \begin{cases} x\left(\frac{n}{2} - 1\right), & \text{for } n \text{ even} \\ 0, & \text{for } n \text{ odd} \end{cases}$$

is given by:

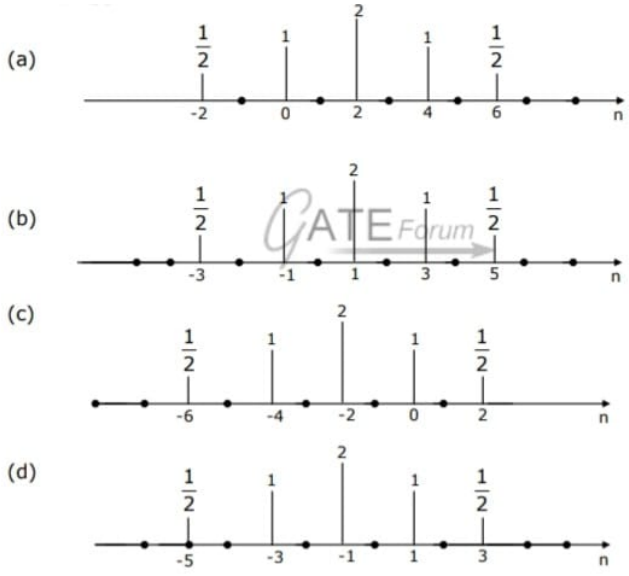

Fig. 0: Options

2 SOLUTION

We can write $x(n)$ as follows:

$$x(n) = \sum_{k=-2}^{2} \left(\frac{1}{2}\right)^{|k|-1} \delta[n-k] \tag{2.0.1}$$

where $\delta[n-k]$ is the discrete unit sample function defined as follows:

$$\delta[n-k] = \begin{cases} 1 \text{ if } n = k \\ 0 \text{ otherwise} \end{cases} \tag{2.0.2}$$

From (2.0.1) we have for even n :

$$y(n) = x\left(\frac{n}{2} - 1\right) \tag{2.0.3}$$

$$= \sum_{k=-2}^{2} \left(\frac{1}{2}\right)^{|k|-1} \delta\left[\frac{n}{2} - 1 - k\right] \tag{2.0.4}$$

$$= \sum_{k=-2}^{2} \left(\frac{1}{2}\right)^{|k|-1} \delta[n - 2(k+1)] \tag{2.0.5}$$

We clearly have $y(n) = 0$ for odd n from (2.0.5). The plot of $y(n)$ is given by:

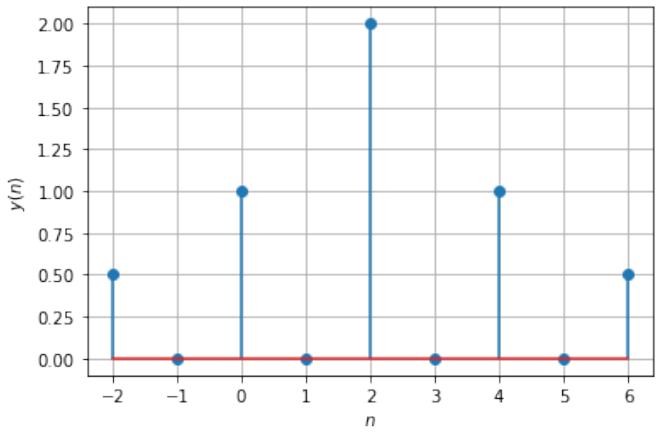

Fig. 0: $y(n)$ vs n

Hence the correct answer is option (a).