

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:

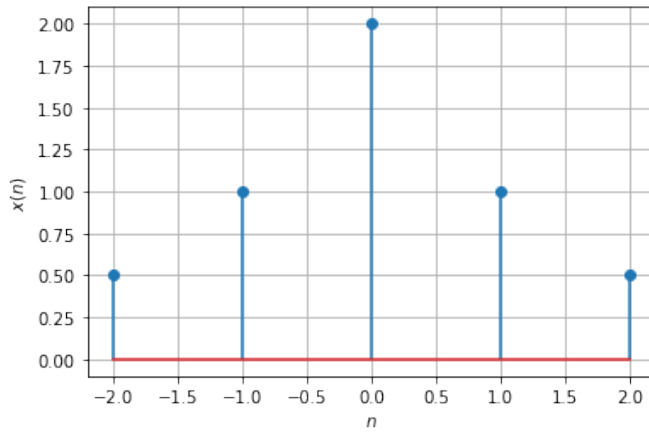


Fig. 0: $x(n)$

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:

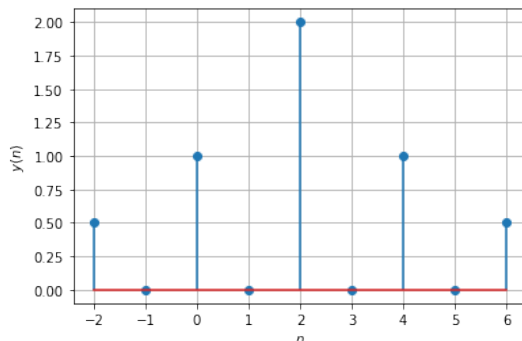


Fig. 0: Option (a)

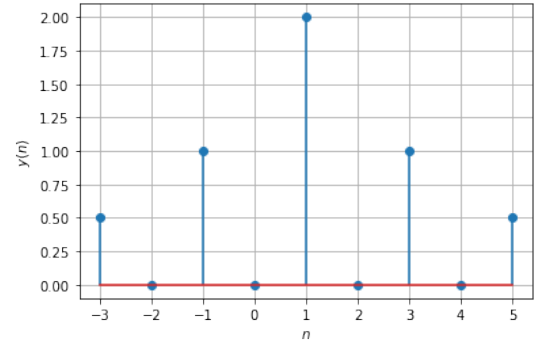


Fig. 0: Option (b)

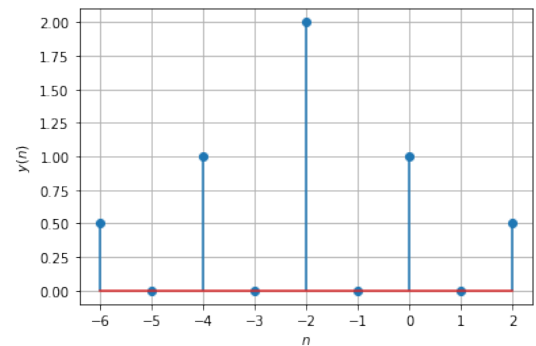


Fig. 0: Option (c)

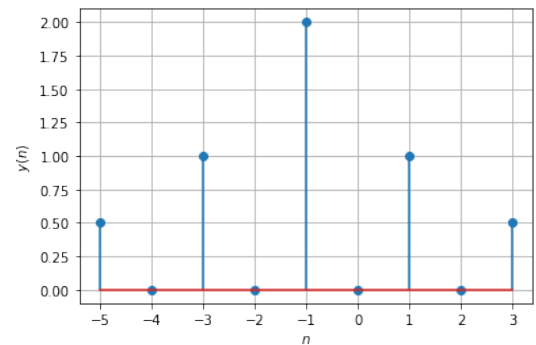


Fig. 0: Option (d)

2 SOLUTION

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

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

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

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

From (2.0.1) we have for even n :

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

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

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

We clearly have $y(n) = 0$ for odd n from (2.0.5). The plots of $x(n)$ and $y(n)$ are given by:

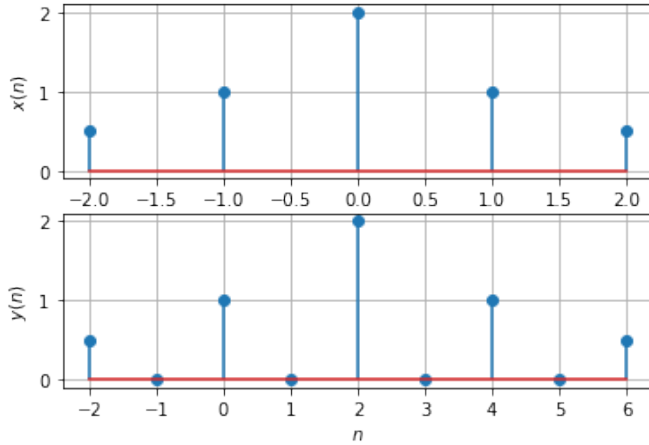


Fig. 0: $x(n)$ and $y(n)$ vs n

Hence the correct answer is option (a).