

# 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](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:

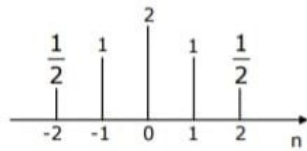


Fig. 0:  $x(n)$

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:

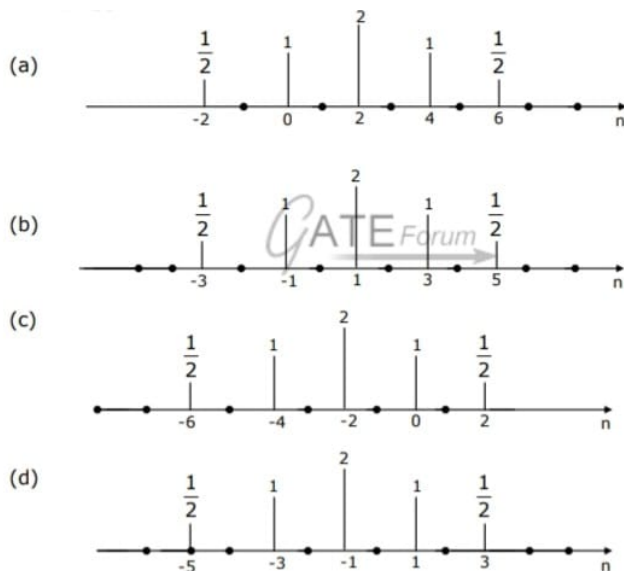


Fig. 0: Options

## 2 SOLUTION

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

$$x(n) = \frac{1}{2}\delta[n+2] + \delta[n+1] + 2\delta[n] + \delta[n-1] + \frac{1}{2}\delta[n-2]$$

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

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

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

We clearly have:

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

$$y(0) = x(-1) = 1 \quad (2.0.4)$$

$$y(2) = x(0) = 2 \quad (2.0.5)$$

$$y(4) = x(1) = 1 \quad (2.0.6)$$

$$y(6) = x(2) = \frac{1}{2} \quad (2.0.7)$$

We also have :

$$y(-1) = y(1) = y(3) = y(5) = 0 \quad (2.0.8)$$

Therefore we can write  $y(n)$  as follows:

$$y(n) = \frac{1}{2}\delta[n+2] + \delta[n] + 2\delta[n-2] + \delta[n-4] + \frac{1}{2}\delta[n-6]$$

$$y(n) = \sum_{k=-1}^3 \left(\frac{1}{2}\right)^{|k-1|-1} \delta[n-2k] \quad (2.0.9)$$

Hence the correct answer is option (a).