

# Quiz 2

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Download all latex codes from

<https://github.com/sujal100/EE3900/blob/main/quiz2/quiz2.tex>

Download all python codes from

<https://github.com/sujal100/EE3900/blob/main/quiz2/codes/code.py>

## 1 PROBLEM 3.18(B)

A causal LTI system has the system function

$$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{\left(1 + \frac{1}{2}z^{-1}\right)(1 - z^{-1})}$$

Find the output of this system,  $y[n]$ , for the input

$$x[n] = e^{j(\pi/2)n}$$

## 2 SOLUTION

$$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{\left(1 + \frac{1}{2}z^{-1}\right)(1 - z^{-1})} \quad (2.0.1)$$

$$= -2 + \frac{\frac{1}{3}}{1 + \frac{1}{2}z^{-1}} + \frac{\frac{8}{3}}{1 - z^{-1}} \quad (2.0.2)$$

Taking the inverse z-transform:

$$h[n] = -2\delta[n] + \frac{1}{3}\left(-\frac{1}{2}\right)^n u[n] + \frac{8}{3}u[n]$$

Here

$$x[n] = e^{j(\pi/2)n}$$

$z = 2$  is inside the ROC. Therefore,

$$y[n] = H(z)|_{z=2} 2^n \quad (2.0.3)$$

$$= \frac{18}{5} 2^n \quad (2.0.4)$$

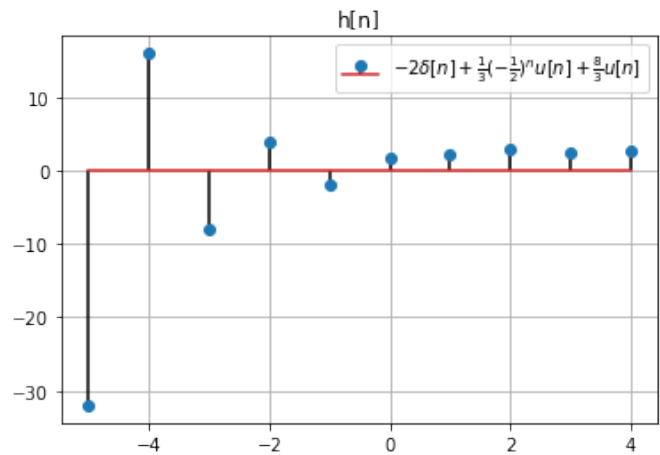


Fig. 0: plot of  $h(n)$