# GATE ASSIGNMENT 2

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Download all latex codes from

https://github.com/sachinkarumanchi/EE3900/tree/main/Gateassignment2/Gateassignment2.tex

GATE EC 2008 Q.84

The impulse response $h(t)$ of linear time - invariant continuous time system is given by $h(t) = e^{-2t}u(t)$, where $u(t)$ denotes the unit step function.
The frequency response $H(\omega)$ of this system in terms of angular frequency $\omega$, is given by $H(\omega)$
(a) $\frac{1}{1+f2\omega}$
(b) $\frac{sin(\omega)}{\omega}$
(c) $\frac{1}{2+j\omega}$
(d) $\frac{j\omega}{2+j\omega}$

Solution

Given,

$$h(t) = e^{-2t}u(t) \tag{0.0.1}$$

Finding the laplace transform

$$\mathcal{L}(h(t)) = \int_0^\infty h(t)e^{s-t}dt \tag{0.0.2}$$

$$= \int_0^\infty e^{-2t}e^{-st}dt \tag{0.0.3}$$

$$= \int_0^\infty e^{-(2+s)t}dt \tag{0.0.4}$$

$$= \frac{1}{2+s} \tag{0.0.5}$$

The Fourier transform is nothing but the Laplace transform evaluated at $s = j\omega$

$$H(\omega) = |\mathcal{L}(f(t))|_{s=j\omega} \tag{0.0.6}$$

$$\implies H(\omega) = \frac{1}{2+j\omega} \tag{0.0.7}$$

Therefore, frequency response $H(\omega) = \frac{1}{2+j\omega}$
Hence, option (c) is correct answer