

Gate 2023 EE Q36

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Gate 2023 EE Q36 The magnitude and phase plots of an LTI systems are shown in figure. Find the transfer function.

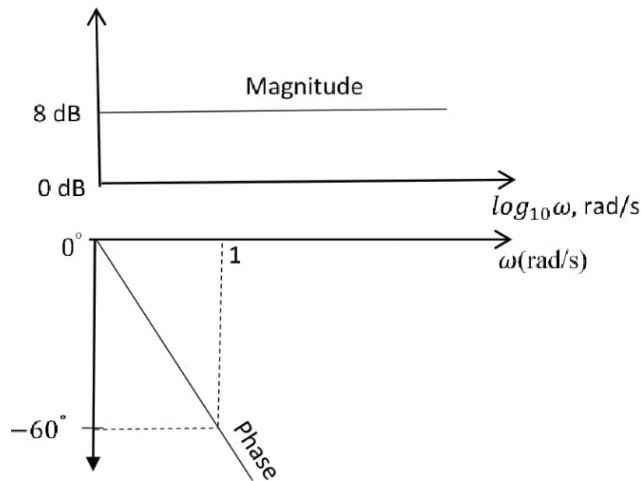


Fig. 0. Graphs

Solution: From the Fig. 0, we can infer that the magnitude of the transfer function does not change with ω and the phase is a function of ω .

$$|H(j\omega)| = 20 \log_{10}(|H(j\omega)|) \quad (1)$$

$$\text{phase} = \angle \frac{-\pi}{3} \omega \quad (2)$$

Substituting the values from Fig. 0, magnitude of transfer function is:

$$8 = 20 \log_{10}(|H(j\omega)|) \quad (3)$$

$$|H(j\omega)| = 10^{0.4} = 2.511 \quad (4)$$

Substituting the values from Fig. 0, The direction of the transfer function is:

$$\angle H(j\omega) = e^{-j\frac{\pi}{3}\omega} \quad (5)$$

$$H(j\omega) = |H(j\omega)| \angle H(j\omega) \quad (6)$$

$$H(j\omega) = 2.511 e^{-j\frac{\pi}{3}\omega} \quad (7)$$

$$= 2.511 e^{-0.032s} \quad (8)$$