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.

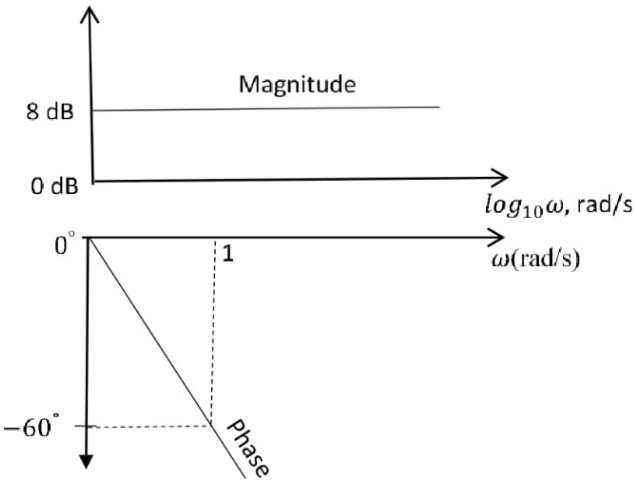

Fig. 0. Graphs

1) $2.511e^{-0.0032s}$
2) $\frac{e^{-2.514s}}{s+1}$
3) $1.04e^{-2.514s}$
4) $2.511e^{-1.047s}$

Solution: From Fig. 0

$$|H(j\omega)| = 8 \tag{1}$$
$$\angle H(j\omega) = \frac{-\pi}{3}\omega \tag{2}$$

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

$$8 = 20\log_{10}(|H(j\omega)|) \tag{3}$$
$$|H(j\omega)| = 10^{0.4} = 2.511 \tag{4}$$

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

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

$$H(j\omega) = 2.511e^{-j\frac{\pi}{3}\omega} \tag{6}$$
$$= 2.511e^{-1.047s} \tag{7}$$