Gate21.IN.45

EE23BTECH11062 - V MANAS

Question:

A sinusoid ($\sqrt{2}sin(t)$)$\mu(t)$,where $\mu(t)$ is the step input,is applied to a system with transfer function G(s)=$\frac{1}{1+s}$.The amplitude of the steady state output is

Solution:

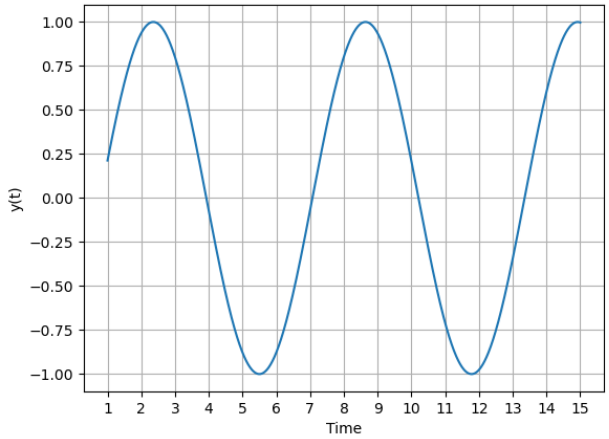

Fig. 1. plot of y(n)

$$G(s) = \frac{1}{s+1} \tag{1}$$

$$G(j\omega) = \frac{1}{j\omega+1} \tag{2}$$

$$|G(j\omega)| = \frac{1}{\sqrt{\omega^2+1}} \tag{3}$$

$$\langle G(j\omega) = -tan^{-1}(\omega) \tag{4}$$

$$|G(j\omega)|_{\omega=1} = \frac{1}{\sqrt{2}}, \langle G(j\omega)_{\omega=1} = -45^\circ \tag{5}$$

$$y(t) = \sqrt{2}|G(j\omega)|_{\omega=1} sin(t - \langle G(j\omega)_{\omega=1})u(t) \tag{6}$$

$$= \sqrt{2} \times \frac{1}{\sqrt{2}} sin(t-45^\circ)u(t) \tag{7}$$

$$= sin(t-45^\circ)u(t) \tag{8}$$

So,the amplitude of steady state output is 1