

Assignment 1

Savarana Datta - AI20BTECH11008

Download all python codes from

<https://github.com/SavaranaDatta/EE3900/tree/main/GATE/codes>

and latex codes from

<https://github.com/SavaranaDatta/EE3900/tree/main/GATE/GATE.tex>

1 PROBLEM(GATE 2019(EC) 21)

Consider the signal

$$f(t) = 1 + 2\cos(\pi t) + 3\sin\left(\frac{2\pi}{3}t\right) + 4\cos\left(\frac{\pi}{2}t + \frac{\pi}{4}\right) \quad (1.0.1)$$

, where t is in seconds. Its fundamental time period in seconds, is

2 SOLUTION

Given,

$$f(t) = 1 + 2\cos(\pi t) + 3\sin\left(\frac{2\pi}{3}t\right) + 4\cos\left(\frac{\pi}{2}t + \frac{\pi}{4}\right) \quad (2.0.1)$$

Individual fundamental frequencies of each term are

$$\omega_1 = \pi \quad (2.0.2)$$

$$\omega_2 = \frac{2\pi}{3} \quad (2.0.3)$$

$$\omega_3 = \frac{\pi}{2} \quad (2.0.4)$$

Let ω_0 be the fundamental frequency of the signal

$$\omega_0 = \text{GCD}(\omega_1, \omega_2, \omega_3) \quad (2.0.5)$$

$$= \text{GCD}\left(\pi, \frac{2\pi}{3}, \frac{\pi}{2}\right) \quad (2.0.6)$$

$$= \text{GCD}\left(\frac{6\pi}{6}, \frac{4\pi}{6}, \frac{3\pi}{6}\right) \quad (2.0.7)$$

$$= \frac{\pi}{6} \quad (2.0.8)$$

Fundamental time period(T) of the signal

$$T = \frac{2\pi}{\omega_0} = 12\text{sec} \quad (2.0.9)$$

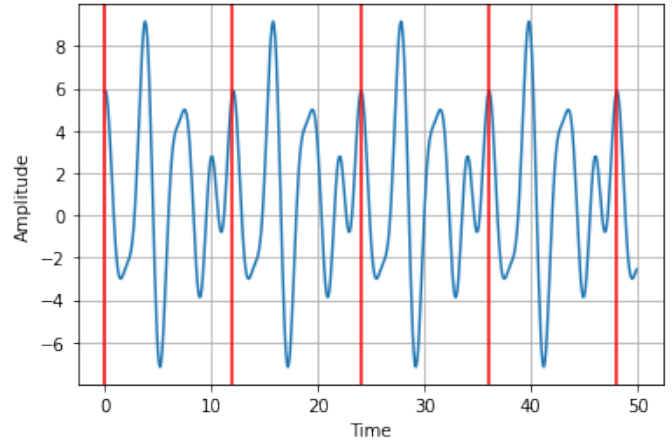


Fig. 0: Plot of the signal