GATE 2023 IN 29

EE23BTECH11065 - prem sagar

Question:

Let y(t)=x($4t$),where x(t) is a continous-time periodic signal of 100s.the fundamental period of y(t) is (**rounded off to the nearest integer**) (GATE IN 29)

Solution:

Symbol	Value	Description
T	100	fundamental period of $x(t)$
T_1		fundamental period of y(t)
ω_0	$\frac{8\pi}{100}$	fundamental frequency of y(t)

TABLE 1
INPUT PARAMETERS

From Table 1
Applying Fourier series:

$$x(t) = \sum_{n=-\infty}^{\infty} c_n e^{\frac{j\,2\pi n\,t}{100}} \tag{1}$$

$$y(t) = x(4t) \tag{2}$$

$$y(t) = \sum_{n=-\infty}^{\infty} c_n e^{\frac{j\,2\pi n\,(4t)}{400}} \tag{3}$$

$$= \sum_{n=-\infty}^{\infty} c_n e^{\frac{j\,8\pi n\,t}{100}} \tag{4}$$

$$T_1 = \frac{2\pi}{\omega_0} \tag{5}$$

$$= \frac{2\pi}{\frac{8\pi}{100}} \tag{6}$$

$$= \frac{100}{4} \tag{7}$$

$$= 25\text{sec} \tag{8}$$

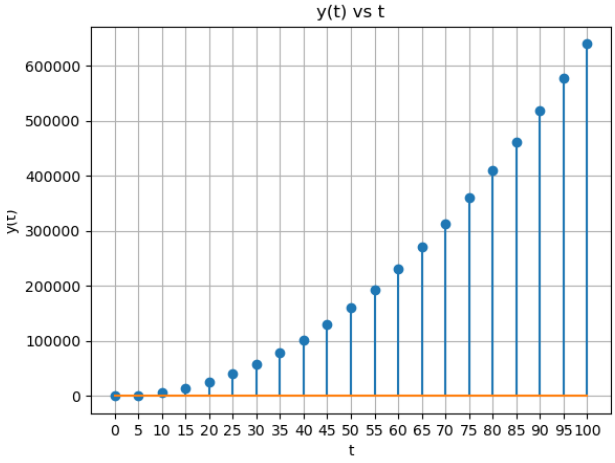

Fig. 1. plot y(t) v/s t