EE3900 - Gate Assignment 2

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Download all latex-tikz codes from

https://github.com/vaishnavi−w/EE3900/blob/main/Gate2/latex2.tex

and python codes from

https://github.com/vaishnavi−w/EE3900/blob/main/Gate2/codes

1 Gate EC - 2005

Choose the function $f(t); -\infty < t < \infty$ for which a fourier series cannot be defined

A) $3\sin(25t)$
B) $4\cos(20t+3)+2\sin(10t)$
C) $exp(-|t|)\sin(25t)$
D) 1

2 Solution

Fourier series is defined for periodic or constant functions

1) $f(t) = 3\sin(25t)$
The given signal is sinusoidal with time period

$$T = \frac{2\pi}{25} \tag{2.0.1}$$

Hence, fourier series can be defined.

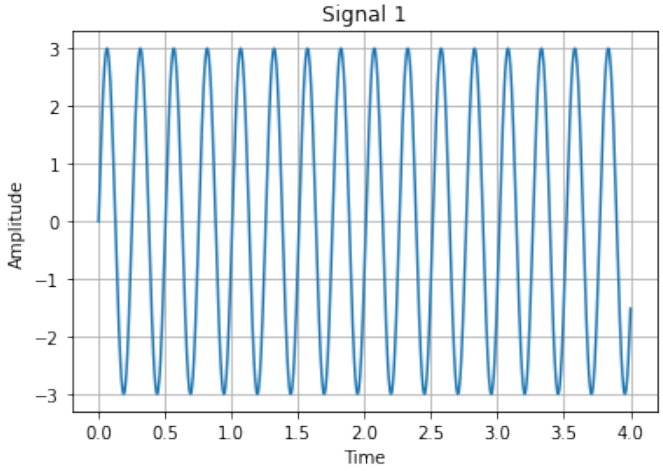

Fig. 1: Plot of Signal 1

2) $f(t) = 4\cos(20t+3)+2\sin(10t)$
The given signal is the sum of two periodic signals with time periods T_1, T_2

$$T_1 = \frac{2\pi}{20} \tag{2.0.2}$$

$$T_2 = \frac{2\pi}{10} \tag{2.0.3}$$

Sum of two periodic signals is periodic if the ratio of their periods is rational

$$\frac{T_1}{T_2} = \frac{2\pi/20}{2\pi/10} = \frac{1}{2} \tag{2.0.4}$$

Thus, the given signal is periodic and fourier series can be defined.

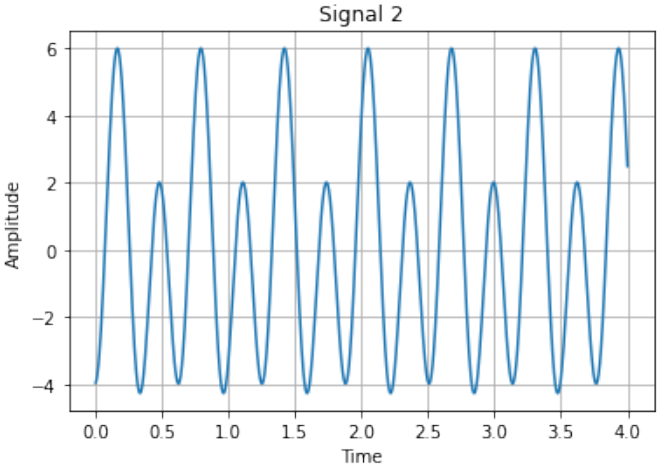

Fig. 2: Plot of Signal 2

3) $f(t) = exp(-|t|)\sin(25t)$
Due to the decaying exponential function, the signal is not periodic. Fourier series cannot be defined for it.

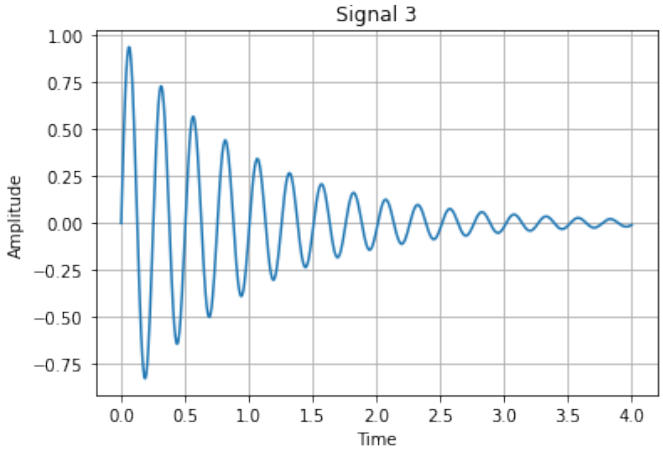

Fig. 3: Plot of Signal 3

4) $f(t) = 1$
   It is a constant function. Fourier series can be defined.

Answer : Option C