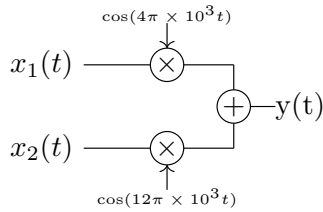


# GATE 2023 - EC 50

EE23BTECH11220 - R.V.S.S Varun

## QUESTION

Let  $x_1(t)$  and  $x_2(t)$  be two band-limited signals having bandwidth  $B = 4\pi \times 10^3$  rad/s each. In the figure below, the Nyquist sampling frequency, in rad/s, required to sample  $y(t)$ , is



- (a)  $20\pi \times 10^3$
- (b)  $40\pi \times 10^3$
- (c)  $8\pi \times 10^3$
- (d)  $32\pi \times 10^3$

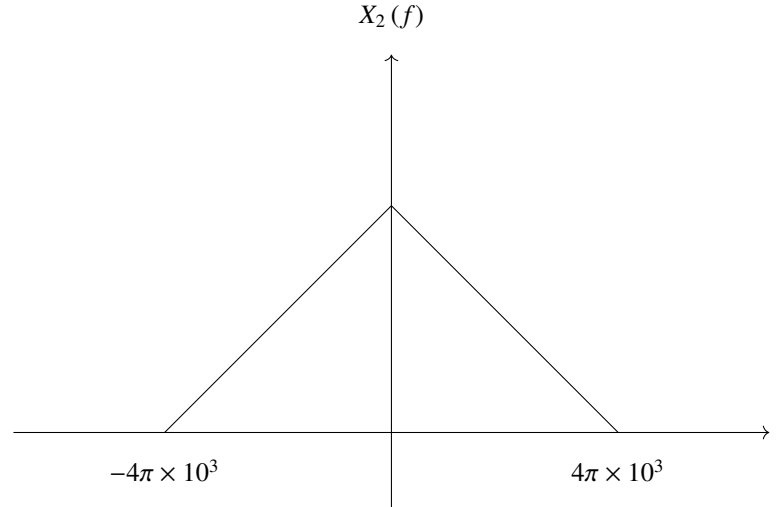
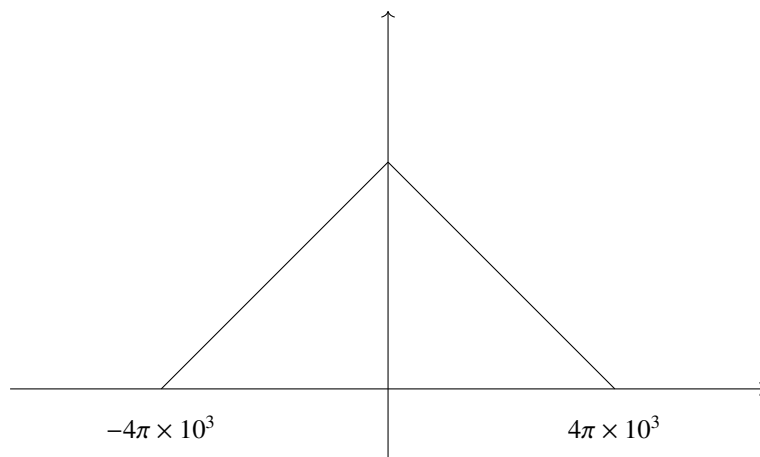
(GATE EC 50)

## SOLUTION

Symbol	Description
$Y(f)$	$y(t)$ in frequency domain
$\omega_m$	Maximum frequency of $Y(f)$
$\omega_s$	Nyquist sampling rate

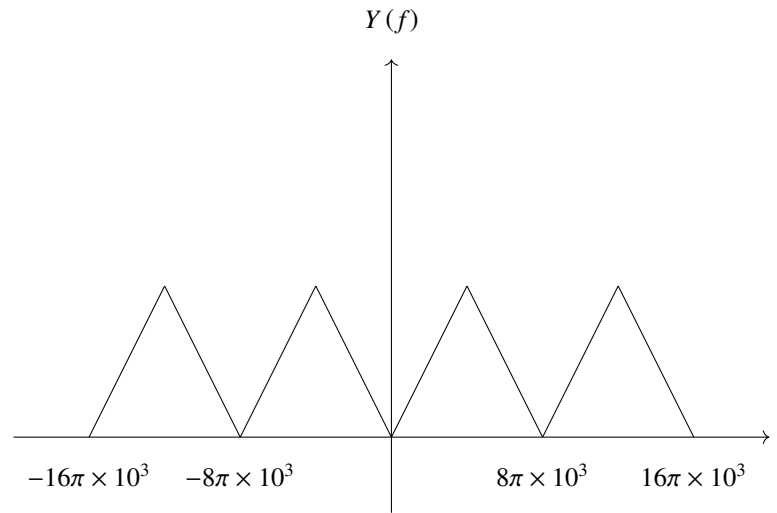
TABLE 0  
TABLE OF PARAMETERS

$x_1(t)$  and  $x_2(t)$  in frequency domain ,



From figure ,

$$y(t) = x_1(t) \cos(4\pi \times 10^3 t) + x_2(t) \cos(12\pi \times 10^3 t) \quad (1)$$



$y(t)$  in frequency domain

$$\omega_m = 16\pi \times 10^3 \text{ rad/sec.} \quad (2)$$

$$\omega_s = 2\omega_m = 32\pi \times 10^3 \text{ rad/sec.} \quad (3)$$