Resolvidos

Nota:

Se $x(t)$ IMPAR $\Rightarrow a_K = 0$

Se $x(t)$ PAR $\Rightarrow b_K = 0$

$\boxed{1}$

Sabemos que $T = 1\,s \Rightarrow F = 1\,Hz$

$T_0 = 1\,s$

Vamos considerar de $[-\frac{1}{2}, \frac{1}{2}]$:

$T_0 = \frac{2\pi}{w_0} \Rightarrow w_0 = 2\pi$

$$a_K = 2\int_{-\frac{1}{2}}^{0} (-1)\cos(K w_0 t)\,dt + 2\int_{0}^{1/2} (1)\cos(K w_0 t)\,dt$$

$$= 2\int_{-\frac{1}{2}}^{0} (-1)\cos(2\pi K t)\,dt + 2\int_{0}^{1/2} \cos(2\pi K t)\,dt$$

$$= \cancel{2}\left(-\left[\frac{\sin(2\pi K t)}{\cancel{2}\pi K}\right]_{-\frac{1}{2}}^{0} + \left[\frac{\sin(2\pi K t)}{\cancel{2}\pi K}\right]_{0}^{1/2}\right)$$

$$= -\frac{\left[\cancel{\sin(2\pi K 0)}^{0} - \sin(\cancel{2}\pi K(-\frac{1}{\cancel{2}}))\right]}{\pi K} + \frac{\left[\sin(\cancel{2}\pi K \frac{1}{\cancel{2}}) - \cancel{\sin(2\pi K 0)}^{0}\right]}{\pi K}$$

$$= \frac{\cancel{\sin(-\pi K)}^{0}}{\pi K} + \frac{\cancel{\sin(\pi K)}^{0}}{\pi K}$$

$$= 0 \,//$$

✓ Teoricamente (IMPAR)

$$b_K = 2\int_{-\frac{1}{2}}^{0} (-1)\sin(2\pi K t)\,dt + 2\int_{0}^{1/2} (1)\sin(2\pi K t)\,dt$$

$$= 2\left(\left[\frac{\cos(2\pi K t)}{2\pi K}\right]_{-1/2}^{0} - \left[\frac{\cos(2\pi K t)}{2\pi K}\right]_{0}^{1/2}\right)$$

$$= \cancel{2}\left(\frac{\cancel{\cos(0)}^{1} - \cos(\cancel{2}\pi K(-\frac{1}{\cancel{2}}))}{\cancel{2}\pi K} - \frac{\cos(\cancel{2}\pi K(\frac{1}{\cancel{2}})) - \cancel{\cos(0)}^{1}}{\cancel{2}\pi K}\right)$$

$$= \frac{1 - \cos(-\pi K)}{\pi K} - \frac{\cos(\pi K) - 1}{\pi K}$$

$$= \frac{1 - \cos(\pi K) - \cos(\pi K) + 1}{\pi K}$$

$$= \frac{2 - 2\cos(\pi K)}{\pi K}$$

$$bK = \begin{cases} 0 & \text{se } K \text{ PAR} \\ \frac{4}{K\pi} & \text{se } K \text{ IMPAR} \end{cases}$$