For the continuous time periodic signal

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}t\right) + 4\sin\left(\frac{5\pi}{3}t\right)$$

Find Fundamental frequency Ω_0 and the fourier series coefficients.

Solution:

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}t\right) + 4\sin\left(\frac{5\pi}{3}t\right).$$

$$T_1 = \frac{2\pi}{\Omega} = \frac{2\pi}{2\pi/3} = 3 \text{ sec}$$

$$T_2 = \frac{2\pi}{\Omega} = \frac{2\pi}{\frac{5\pi}{3}} = 6/5 \text{ sec}$$

$$\frac{T_1}{T_2} = \frac{3}{6/5} = \frac{15}{6} = \frac{5}{2}$$

$$\boxed{\frac{T_1}{T_2} = \frac{5}{2}}$$

$$\boxed{T = 2T_1 = 5T_2} \Rightarrow \text{Fundamental time period.}$$

$$T = 2(3) = 6 \text{ sec}$$

W.K.T

$$\Omega_0 = \frac{2\pi}{T} = \frac{2\pi}{6} = \frac{\pi}{3}$$

$$\boxed{\Omega_0 = \frac{\pi}{3}} \Rightarrow \text{fundamental frequency}$$

W.K.T

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\Omega_0 t}$$

$$= \ldots + C_{-2} e^{j(-2)\Omega_0 t} + C_{-1} e^{j(-1)\Omega_0 t} + C_0 + C_1 e^{j\Omega_0 t} + C_2 e^{j2\Omega_0 t} + \ldots$$

The given problem is.

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}t\right) + 4\sin\left(\frac{5\pi}{3}t\right)$$

$$= 2 + 0.5\left[e^{j\frac{2\pi}{3}t} + e^{-j\frac{2\pi}{3}t}\right] + \frac{2}{j}\left[e^{j\frac{5\pi}{3}t} - e^{-j\frac{5\pi}{3}t}\right]$$

$$= 2 + 0.5e^{j2(\frac{\pi}{3})t} + 0.5e^{j(-2)\frac{\pi}{3}t} - 2je^{j(\frac{\pi}{3})5t} + 2je^{j(-5)\frac{\pi}{3}t}$$

$C_0 = 2.$

$C_2 = 0.5$

$C_{-2} = +0.5$

$C_5 = -2j$

$C_{-5} = 2j$