SAS

Tutorial Class:-7 Fourier series representation

Problem 1:- A continuous-time periodic signal $f(t)$ is real valued and has a fundamental period $T = 8$. The non-zero Fourier Series coefficients for $f(t)$ are $a_1 = a_{-1} = 2$, $a_3 = a_{-3} = 4j$. Express $f(t)$ in the form

$$f(t) = \sum_{n=0}^{\infty} a_n \cos(\omega_n t + \phi_n)$$

Problem 2:- For the continuous-time periodic signal $f(t) = 2 + \cos(\frac{2\pi}{3}t) + 4\sin(\frac{5\pi}{3}t)$, Determine the fundamental frequency ω_0 and Fourier series coefficients F_n such that

$$f(t) = \sum_{n=-\infty}^{+\infty} F_n e^{jn\omega_0 t}$$

Problem 3:- When the impulse-train signal $x(n) = \sum_{k=-\infty}^{+\infty} \delta(n - 4k)$

is given input to a particular LTI system with the frequency response $H(e^{j\omega})$, the output of the system is found to be

$$y(n) = \cos\left[\frac{5\pi}{2}n + \frac{\pi}{4}\right].$$

Determine the values of $H(e^{jn\pi/2})$ for n=1, 2, 3 and 4