

ELEG 3124 Assignment # 7

1. Find the periods and Fourier series coefficients of the following signals

(a) $s(t) = \sum_{n=-\infty}^{\infty} \delta(t - n)$.

(b) $s(t) = \sum_{n=-\infty}^{\infty} (-1)^n \delta(t - n)$

2. A voltage $x(t)$ is applied to the circuit shown in Fig. 2. If the Fourier coefficients of $x(t)$ are given by

$$c_n = \frac{1}{n^2 + 1} e^{jn\frac{\pi}{3}} \quad (1)$$

- (a) Express the system in the form of a differential equation
- (b) Find the transfer function of the system
- (c) Plot the amplitude and phase of the transfer function with Matlab
- (d) Find the first three non-zero harmonics of $y(t)$

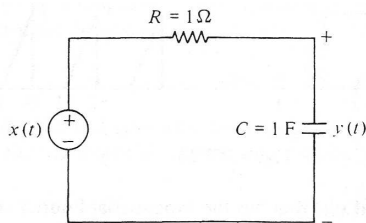


Figure 1: Questions 2, 3, and 4.

3. Repeat Question 3 if $y(t)$ is the voltage across the resistor instead.
4. For the RC circuit shown in Figure 2, find the voltage $y(t)$ across the capacitor if the input is

$$x(t) = 1 + 3 \cos\left(t + \frac{\pi}{6}\right) + \cos(2t) \quad (2)$$