ECE 317

Assignment #6

1) Compute the trigonometric and complex exponential Fourier series for the signals shown in Figure 1.

![Figure 1](image_url)
2) For each of the following signals, compute the complex exponential Fourier series by using trigonometric identities, and then sketch the amplitude and phase spectra for all values of $n$.

(a) $x(t) = \cos(5t + \theta)$,

(b) $x(t) = \sin t + \cot t$,

(c) $x(t) = \sin^2 4t$.

(d) $x(t) = \cos 2t \sin 3t$.

(e) $x(t) = \cos^2 5t$

(f) $x(t) = \cos 3t + \cos 5t$. 
(3) A periodic signal with period $T$ has Fourier

coefficient $C_n$; that is,

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{j \omega_0 t}, \quad \omega_0 = \frac{2\pi}{T}, \quad -\infty < t < \infty.$$ 

Compute the Fourier coefficient $C_n$ for the

periodic signal $v(t)$ where:

(a) $v(t) = x(t-1)$

(b) $v(t) = \frac{d}{dt} x(t)$

(c) $v(t) = x(t) e^{j \frac{2\pi}{T} t}$.

(d) $v(t) = x(t) \cos \left( \frac{2\pi}{T} t \right)$. 
(4) The voltage $x(t)$ shown in Fig. 2 is applied to the RL circuit shown in Fig. 3. Find the value of $L$ so that the peak value of the largest ac component (harmonic) in the output response $y(t)$ is $\frac{1}{30}$ of the dc component of the output.

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**Fig. 2**

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**Fig. 3**