Name *Answers*

EE3032 – Dr. Durant – Quiz 7
Fall 2017, Week 7

1. (2 points) Find the Fourier series X for $x(t) = 3 - 5\sin(4\pi t) + 7\cos(8\pi t)$. Note: $\Omega_0 = 4\pi$.
2. (3 points) Let $w(t) = x(t) + 2\cos(2\pi t)$. Note that this changes Ω_0. Show how you can find the Fourier series for w(t) by (a) modifying your solution for X to account for the new Ω_0 and then (b) adding the contribution of the term at the new frequency.
3. (2 points) Let $H(j\Omega) = 1 - |\Omega| / 8\pi$ be the transfer function of an LTI system. Find the value of this transfer function at the relevant frequencies that exist in x(t).
4. (3 points) Find the output y(t) when x(t) is input to this system. Hint: $Y_k = X_k \times H_k$.

(1) $x(t) = 3 - 5\sin(\Omega_0 t) + 7\cos(2\Omega_0 t)$

$X_k = \left\{ \frac{7}{2}, \frac{-5j}{2}, \underline{3}, \frac{5j}{2}, \frac{7}{2} \right\}$

(2) (a) Ω_0 was cut in half, so k gets replaced w/ 2k.

$X_k = \left\{ \frac{7}{2}, 0, \frac{-5j}{2}, 0, \underline{3}, 0, \frac{5j}{2}, 0, \frac{7}{2} \right\}$

(b) $+ 2\cos(\Omega_0 t)$

$W_k = \left\{ \frac{7}{2}, 0, \frac{-5j}{2}, 1, 3, 1, \frac{5j}{2}, 0, \frac{7}{2} \right\}$

(3)

Ω	$H(j\Omega)$
0	$1 - 0/8\pi = 1$
4π	$1 - 4\pi/8\pi = \frac{1}{2}$
8π	$1 - 8\pi/8\pi = 0$

$H(-j\Omega) = H(j\Omega)$ for this function.

(4) From (1): $X_k = \left\{ \frac{7}{2}, \frac{-5j}{2}, \underline{3}, \frac{5j}{2}, \frac{7}{2} \right\}$

$H_k = \left\{ 0, \frac{1}{2}, \underline{1}, \frac{1}{2}, 0 \right\}$

$Y_k = \left\{ 0, \frac{-5j}{4}, \underline{3}, \frac{5j}{4}, 0 \right\}$

$y(t) = 3 - \frac{5}{2}\sin(4\pi t)$