EC2102: Signals and Systems
Quiz - 2
April 5, 2018

Roll. No.:_____

Name:_____

Attach question paper with answer sheet

Answer ALL questions clearly and concisely.

Marks: 40
Time: 50 minutes

1. Consider a sinusoidal signal, $x(t) = A\sin(\omega_0 t)$

   (a) What are the Fourier series coefficients of $y(t)$ the output of half-wave rectifier (i.e. $y(t) =$? (Hint: Find a_k for $k = 0, 1$ and then for k even and k odd)

   (b) Which F.S. coefficient of $y(t)$ has the largest magnitude ? What is the frequency, $\hat{\omega}$ of the corresponding complex exponential? [??]

2. Let $x(t)$ (**which is real and even**) have CTFT shown in Figure below.

   (a) Plot the CTFT of $y(t) = x(t)\cos(4\pi t)$.

   (b) Plot the CTFT of $z(t) = x(2t)$.

   (c) What is the relation between $y(t)$ and $z(t)$? [??]

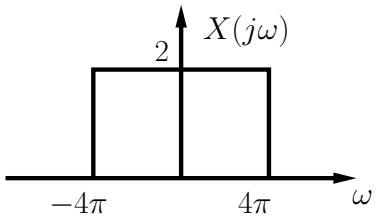

Figure 1(): For Question 2

3. Evaluate the power of signal $x(t)$. (Hint: Use Parseval's Theorem)

$$x(t) = 8\frac{sin(4\pi t)}{\pi t}cos(2\pi t)$$

[??]

4. An LTI system has an impulse response $h(t) = e^{-4t}u(t)$. The input $x(t) = \sin(4\pi t) + \cos(6\pi t + \frac{\pi}{4})$. Find the Fourier series representation of the output.

5. An ideal lowpass filter with cutoff frequency 500 Hz is an LTI system H_l whose frequency response is:

$$H_l(\omega) = \begin{array}{ll} 1 & |\omega| \leq 2\pi(500)\text{rad/s} \\ 0 & \text{otherwise} \end{array}$$

   (a) What is the response of this filter to the input signal $x(t) = \cos(1500\pi t) + \sin(3000\pi t)$?

   (b) What is the response of this filter for a periodic square wave with period 4.5 ms? The square wave oscillates between +1 V and −1 V with 50% duty cycle and is an even function of time.