EBU4375: SIGNALS AND SYSTEMS

TOPIC 3- TUTORIAL

Queen Mary
University of London

Go to mentimeter

2895 0478

Problem 1

- Find the Fourier Transforms of the following signals:

$a)$ $\delta[n - 1] + \delta[n + 1]$

$b)$ $\delta[n + 2] - \delta[n - 2]$

Problem 2

- Given that x[n] has a Fourier transform X(Ω), express the transform of the following signal in terms of X(Ω). Hint: Use the Fourier transform properties.

$$x_1[n] = x[1 - n] + x[-1 - n]$$

-

$$x_1[n] = x[1-n] + x[-1-n]$$

Problem 2

-

Problem 3

- Determine the Fourier transform for $-\pi \leq \Omega \leq \pi$ in the case of each of the following periodic DT signals:

$a)$ $\text{x}[n] = \sin\left(\dfrac{\pi}{3}n + \dfrac{\pi}{4}\right)$

$b)$ $\text{y}[n] = 2 + \cos\left(\dfrac{\pi}{6}n + \dfrac{\pi}{8}\right)$

Problem 3

$$a) \quad \sin\left(\frac{\pi}{3}n + \frac{\pi}{4}\right)$$

Problem 4

- An LTI system with impulse response $h_1[n] = \left(\frac{1}{3}\right)^n u[n]$ is connected in parallel with another LTI system with impulse response $h_2[n]$. The resulting parallel interconnection has the frequency response as shown below. Determine $h_2[n]$.

$$H(\Omega) = \frac{-12 + 5e^{-j\Omega}}{12 - 7e^{-j\Omega} + e^{-j2\Omega}}$$
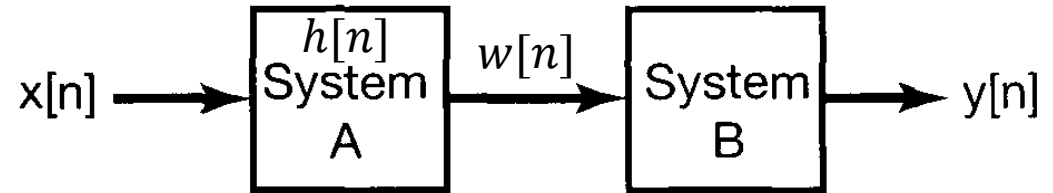
$$H(\Omega) = \frac{-12 + 5e^{-j\Omega}}{(a - e^{-j\Omega})(b - e^{-j\Omega})}$$

Problem 4

$$H(\Omega) = \frac{-12 + 5e^{-j\Omega}}{12 - 7e^{-j\Omega} + e^{-j2\Omega}} \qquad h_1[n] = \left(\frac{1}{3}\right)^n u[n]$$

Problem 5

- Consider two discrete-time systems A and B, where system A is an LTI system with unit sample response
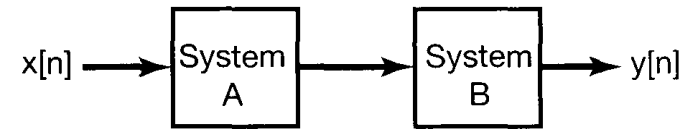
$$h[n] = \left(\frac{1}{2}\right)^n u[n]$$

- And system B with the following relationship between its input $w[n]$ and output $y[n]$:

$$y[n] = w[n] + 2$$

- Does the commutative property apply?

Problem 5

$$h[n] = \left(\frac{1}{2}\right)^n u[n]$$

$$y[n] = w[n] + 2$$