

# ECE 2713

## Homework 5

Spring 2024

Dr. Havlicek

1.  $H$  is a discrete-time LTI system with impulse response

$$h[n] = \left(\frac{1}{4}\right)^n u[n].$$

The system input is given by

$$x[n] = \left(\frac{1}{3}\right)^n u[n].$$

Use the discrete-time Fourier transform (DTFT) to find the output signal  $y[n]$ .

2. Text problem P-5.1. Hint: the “difference equation” for the FIR filter is the system input-output equation that relates the output signal  $y[n]$  and the input signal  $x[n]$ .
3. Consider a discrete-time LTI system  $H$  with input-output equation

$$y[n] = 2x[n] - 3x[n - 1] + 2x[n - 2].$$

Find the frequency response  $H(e^{j\omega})$  and impulse response  $h[n]$ . Is  $H$  an FIR filter or an IIR filter?

4. Text problem P-6.4, part (a) only. Remember: the book writes  $\hat{\omega}$  instead of  $\omega$ !
5. Text problem P-6.19.

Scan or photograph your paper and upload to Canvas.

**DUE: 4/14/2024 11:59 PM**