

UNIVERSITY OF THE WEST INDIES
CAVE HILL CAMPUS

Department of Computer Science, Mathematics & Physics

ELET3230 - Digital Signal Processing

Class Test 1

Tuesday, October 20, 2020

1. (a) Find the difference equation of a DSP whose impulse response is given by $h[n] = 2\delta[n] - 3\delta[n - 1] + \delta[n - 3]$ [2]

(b) The digital signal $x[n] = (1 - 0.5n)(u[n] - u[n - 4])$ is sent through the DSP in (a), find the output signal $y[n]$

(i) by convolving $x[n]$ with $h[n]$ [7]

(ii) by using the difference equation (show all steps) [5]

(c) Find the first 3 terms of the overall impulse response of a DSP that is the PARALLEL combination of two filters.

$$\begin{aligned} h_1[n] &= \delta[n] - 0.2\delta[n - 2] + 0.4\delta[n - 4] \\ h_2[n] &= e^{-0.3n}(u[n] - u[n - 3]) \end{aligned} \quad [6]$$

2. A DSP has the following difference equation

$$y[n] = 0.5y[n - 1] - 0.5x[n] + x[n - 1]$$

Find the frequency response (amplitude and phase) for $\Omega = 1.2\pi$ and $\Omega = \frac{\pi}{2}$ (remember to use radians mode on your calculator) [8]

What do you notice about your results ? [2]

Calculate the Steady State response of this DSP [4]