ISRA UNIVERSITY
Islamabad Campus

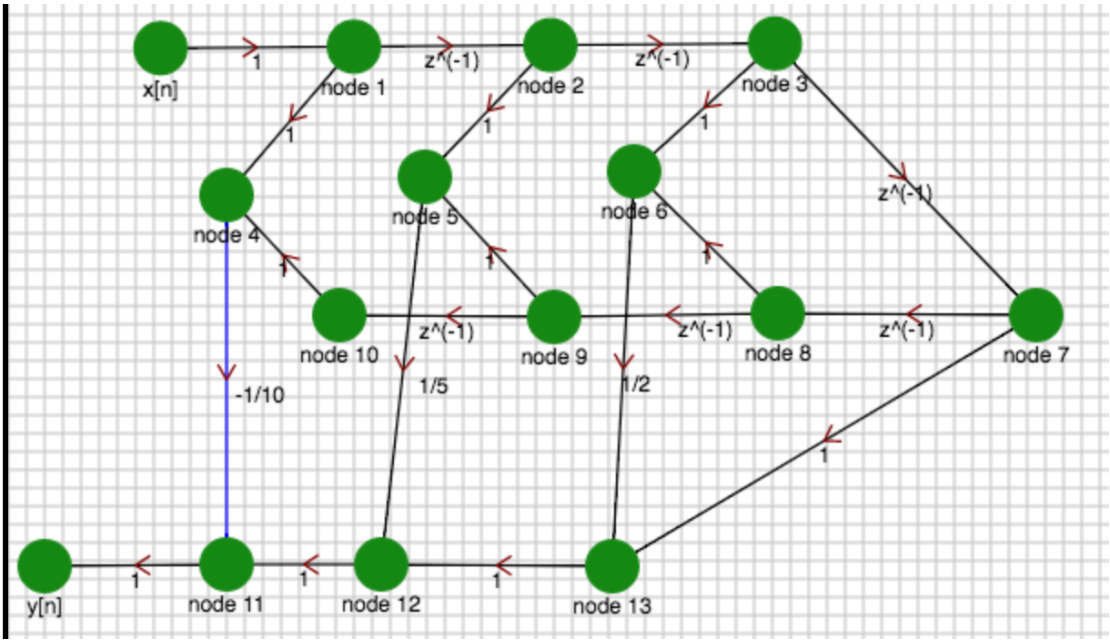
Department of Electrical Engineering
Program: B.E. (Electrical)
Semester – Spring 2016

EL-322 Digital Signal Processing

Quiz – 4 Solution
Marks: 10 **Handout Date: 18/05/2016**

Question # 1:

Find the frequency response of the system defined by the network:



Solution:

We recognize this structure as a linear phase system with a unit sample response:

$$h(n) = -0.1[\delta(n) + \delta(n-6)] + 0.2[\delta(n-1) + \delta(n-5)] + 0.5[\delta(n-2) + \delta(n-4)] + \delta(n-3)$$

Therefore the frequency response is:

$$H(e^{j\omega}) = -0.1[1 + e^{-j6\omega})] + 0.2[e^{-j\omega} + e^{-j5\omega}] + 0.5[e^{-j2\omega} + e^{-j4\omega}] + e^{-j3\omega}$$

Question # 2:

Consider the Linear shift invariant filter with system function:

$$H(z) = \frac{1 + 0.875z^{-1}}{(1 + 0.2z^{-1} + 0.9z^{-2})(1 - 0.7z^{-1})}$$

Draw a signal flow graph for this system using Direct Form I.

Solution:

Writing the system function as a ratio of polynomials in z^{-1},

$$H(z) = \frac{1 + 0.875z^{-1}}{1 - 0.5z^{-1} + 0.76z^{-2} - 0.63z^{-3}}$$

The direct form I realization of H (z) is as follows: