

- 1) Obtain the direct form I, direct form II, cascade, and parallel structures for the system described by the LCCDE:

$$y(n) = y(n-1) - \frac{1}{2}y(n-2) + x(n) - x(n-1) + x(n-2)$$

- 2) Determine the cascade and parallel realizations for the system function

$$H(z) = \frac{10(1 - \frac{1}{2}z^{-1})(1 - \frac{2}{3}z^{-1})(1 + 2z^{-1})}{(1 - \frac{3}{4}z^{-1})(1 - \frac{1}{8}z^{-2})[1 - (\frac{1}{2} + j\frac{1}{2})z^{-1}][1 - (\frac{1}{2} - j\frac{1}{2})z^{-1}]}$$

- 3) Consider a LTI system with system function

$$H(z) = z^{-5}(z - 0.9)(z - j)(z + j)[1 - (0.5 - j0.5)z^{-1}][1 - (0.5 + j0.5)z^{-1}] \cdot [1 - (0.5 - j0.5)z][1 - (0.5 + j0.5)z]$$

Show that the system can be realized as the cascade of a first, a second and a fourth order linear phase FIR SUBSYSTEMS

- 4) Consider an FIR lattice filter with coefficients $K_1 = 0.65$, $K_2 = -0.34$ and $K_3 = 0.8$

- a) Find its impulse response by tracing a unit impulse input through the lattice structure.