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(Q 7) Obtain the cascade realization of system function

$$H(z) = (1+2z^{-1}-z^{-2})(1+z^{-1}-z^{-2})$$

build this filter using building blocks in simulinks. make reference model.

Ans

Given

$$H(z) = \underbrace{(1+2z^{-1}-z^{-2})}_{H_1(z)}\underbrace{(1+z^{-1}-2z^{-2})}_{H_2(z)}$$

$$H(z) = H_1(z) + H_2(z)$$

$$H_1(z) = \frac{Y_1(z)}{X_1(z)} = 1 + 2z^{-1} - 2z^{-2}$$

$$Y_1(z) = X(z) + 2z^{-1}X(z) + 2z^{-2}X(z) \quad \text{---} \ (1)$$

$$H_2(z) = \frac{Y_2(z)}{X_2(z)} = 1 + z^{-1} - 2z^{-2}$$

$$Y_2(z) = X_2(z) + z^{-1}X_2(z) - 2z^{-2}X_2(z) \quad \text{---} \ (2)$$

by cascading both eq (1) & (2) and using direct form realization.