Sample Exam ECE 428/528   Final
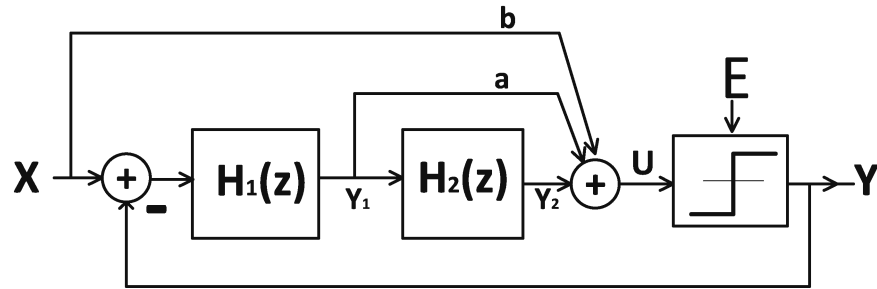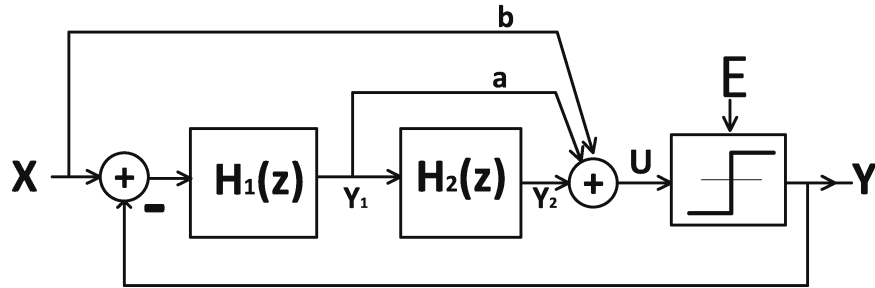
2(a) For the feedforward delta-sigma loop, find "**b**" such that the signal transfer function is 1.

2(b) Find "**a**" such that for $H_1(z)=H_2(z)=(z-1)^{-1}$, the noise transfer function is $(1-z^{-1})^2$.

$$H_1(z) = H_2(z) = z^{-1}/(1-z^{-1})$$

$$Y_1 = U_1(X-Y)$$

$$Y_2 = H_1 H_2(X-Y)$$

$$U = bX + aY_1 + Y_2 = bX + (a+H_2)H_1(X-Y)$$

$$U = [b+(a+H_2)H_1]X - (a+H_2)H_1 Y = Y - E$$

$$[1+(a+H_2)H_1]Y = [b+(a+H_2)H_1]X + E ::: b=1 \text{ for unity transfer function}$$

$$Y = X + E / [ ] \quad :::: 1/[ ] = 1/(1+aH_1+H_1^2) = (1-z^{-1})^2/((1-z^{-1})^2 + az^{-1}(1-z^{-1}) + z^{-2})$$

The denominator is:

$$1 - 2z^{-1} + z^{-2} + az^{-1} - az^{-2} + z^{-2} = 1 \implies a=2$$