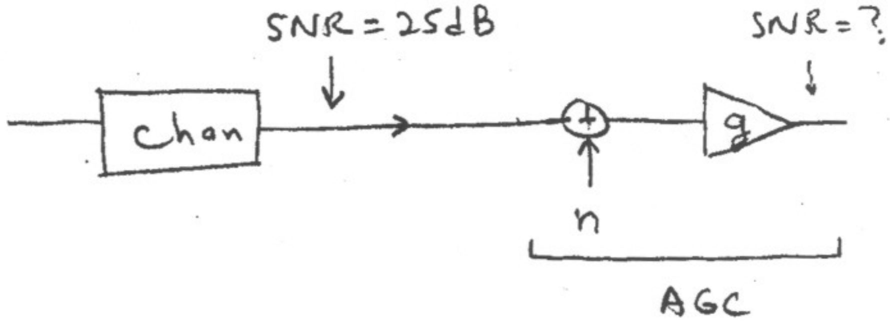
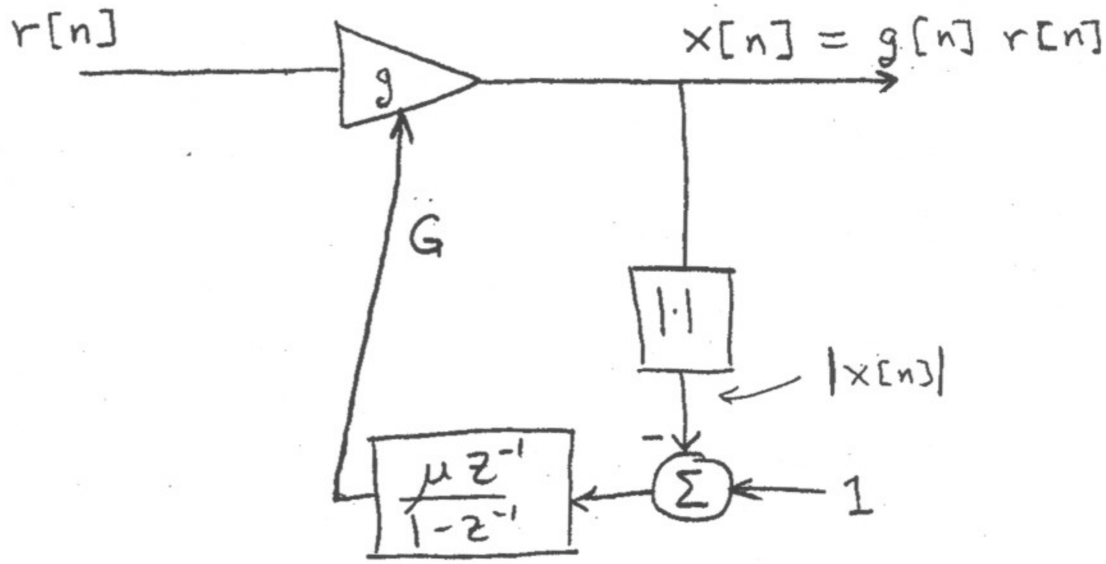
EEC 215 HW#1

1. The SNR at the output of the channel is 25 dB. An AGC adds noise n that is 10 dB below the noise at the channel output. What is the SNR after the AGC?



2.



A discrete-time AGC is shown above.

Let $r[n] = A\cdot(-1)^n$. Use $g = G$ and $\mu = 0.01$.

a) simulate this AGC. Use $G[0]=1$ and $A=0.2$ Plot $G[n]$ and $x[n]$ vs. n.

b) repeat a) w/ $A=5$.

c) Compare the results of a) & b).

d) Try 3 different values of μ.
What changes when μ changes?

e) Let $g = G + 0.01G^3$. Simulate the AGC. Does this nonlinearity cause a problem? Why or why not?

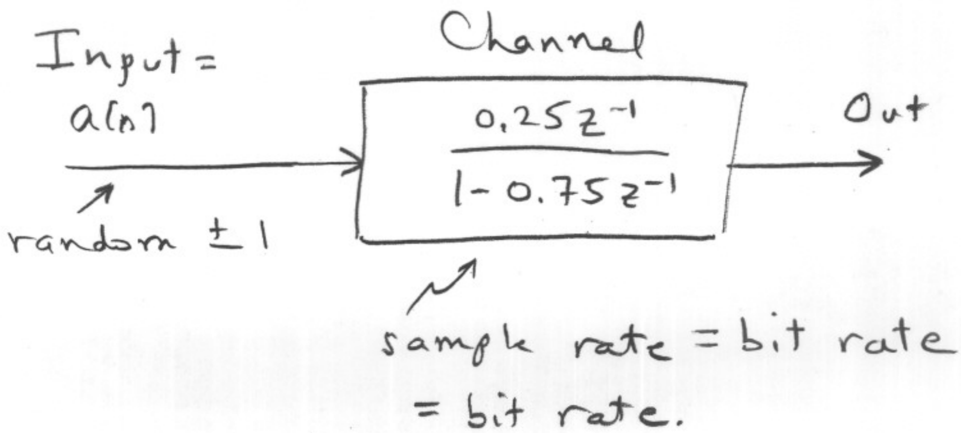
f) Introduce a DC offset at the input to the d-time integrator of 0.1. What is its effect? Explain. (Use $A=0.2$).

g) Add an offset of 0.1 to $r[n]$. What is its effect? Explain. (Use $A=0.2$)

3. Plot the magnitude and phase vs. frequency for the d-t integrator: $\frac{z^{-1}}{1-z^{-1}}$.

Compare its mag & phase to that of a c-t integrator: $\frac{1}{s}$. How are they similar? How do they differ?

4. Compute (using simulation results) the Peak/rms ratio for the channel input and output below:



Peak = peak magnitude

rms = $\sqrt{\mathrm{Var}(\cdot)}$