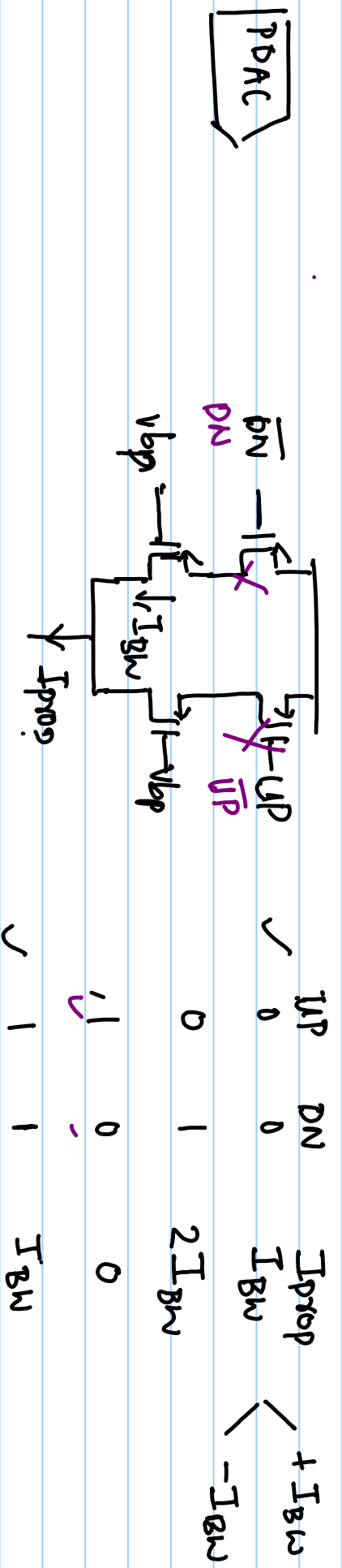
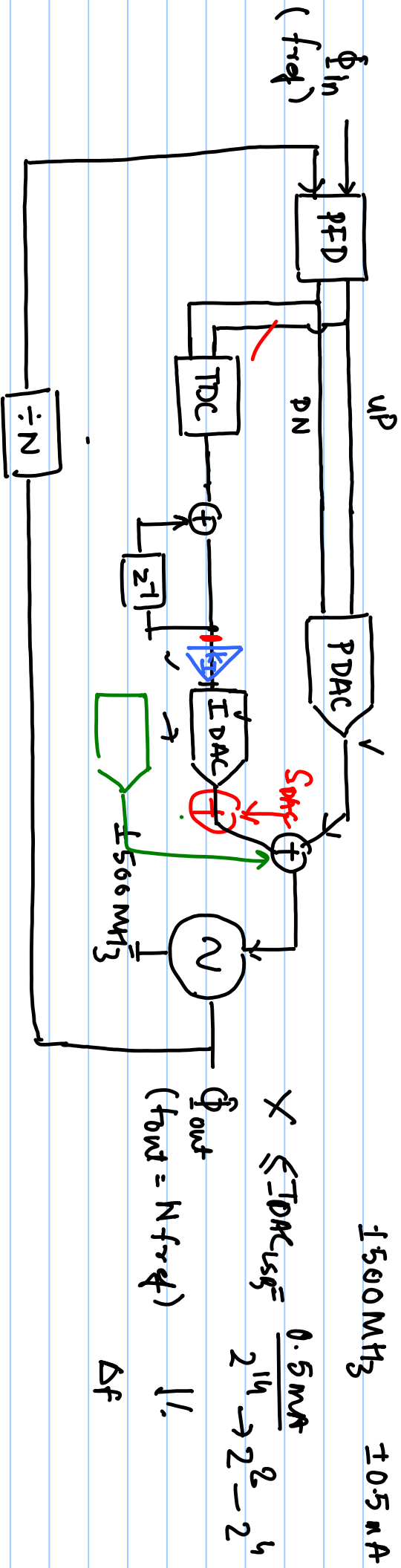
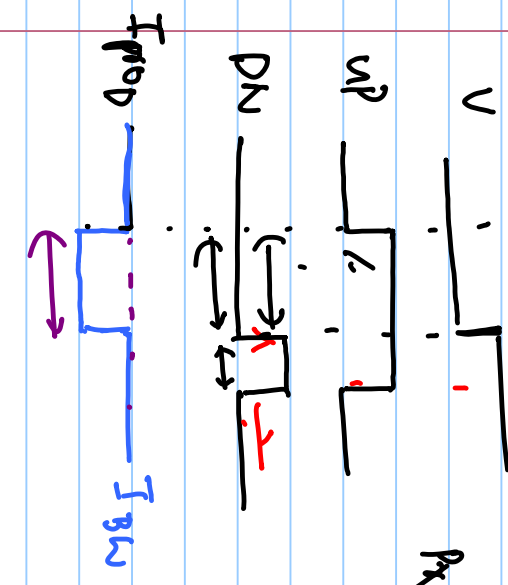


Lecture # 44

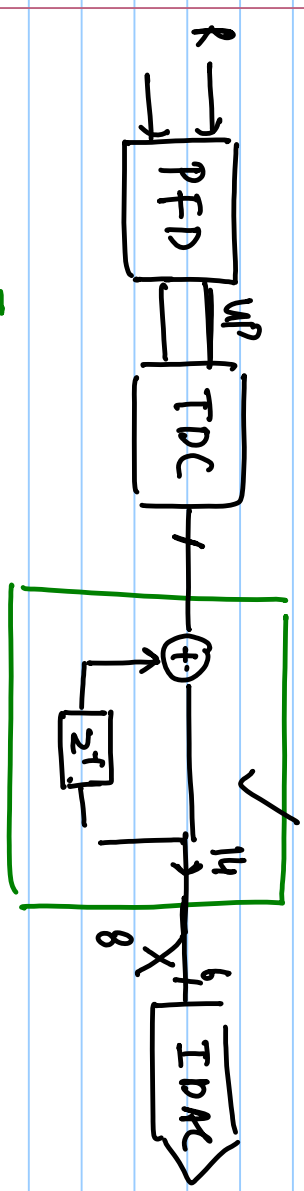
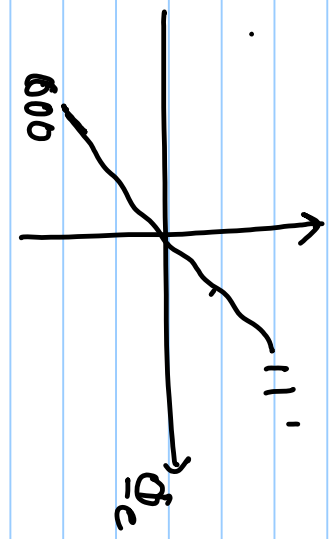


$$R \rightarrow \Phi_e \xrightarrow{UP/DN} \pm I_{BW} \times \Phi_e \times K_{CCO}$$

Prop. path gain = $\frac{\Phi_e}{2\pi}$ $I_{BW} \cdot \frac{2\pi K_{CCO}}{D} = \Phi_{out}$



$$\frac{1}{1-z^{-1}}$$

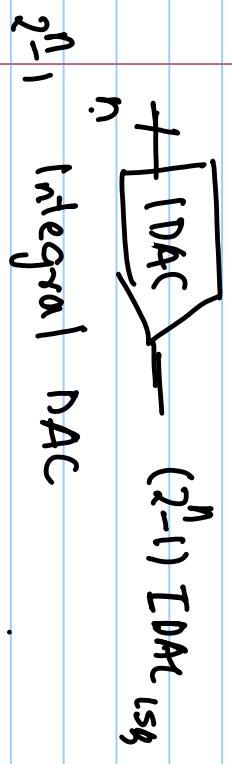


1441
 $15 \times IDAC_{LSB} =$
 $1 \times IDAC_{LSB} \cdot D$

$$z = e^{sT}$$

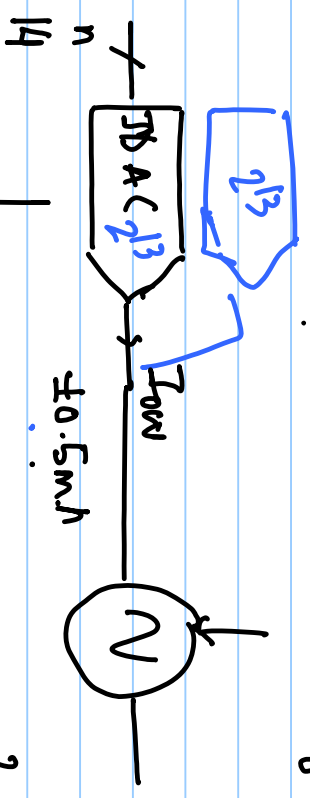
$$\frac{\Phi_e}{2\pi} \times K_{TDC} \times \frac{K_I z^{-1}}{1-z^{-1}} \times IDAC_{LSB} \times \frac{2\pi K_{CCO}}{D}$$

$$I_{IN} = \frac{1}{2K} \left[2K I_{BW} K_{CCO} + K_I \cdot K_{TDC} \cdot I_{DAC_{LSB}} \frac{2^N - 1}{1 - 2^{-1}} \times \frac{2K K_{CCO}}{3} \right] \frac{1}{N}$$

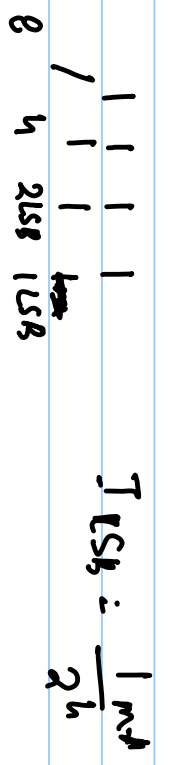


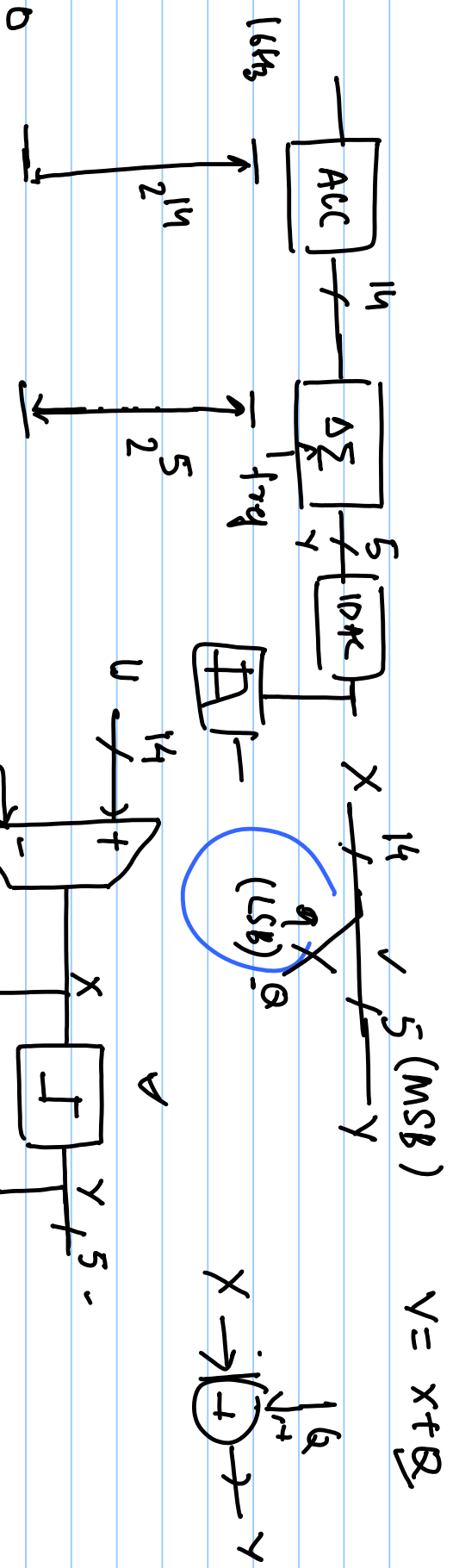
$$I_{DAC_{LSB}} \rightarrow I_{DAC_{LSB}} \times K_{CCO} = \Delta F_I$$

$$N f_{req} \Delta F_I < f_{int} < N f_{req} + \Delta F_I$$

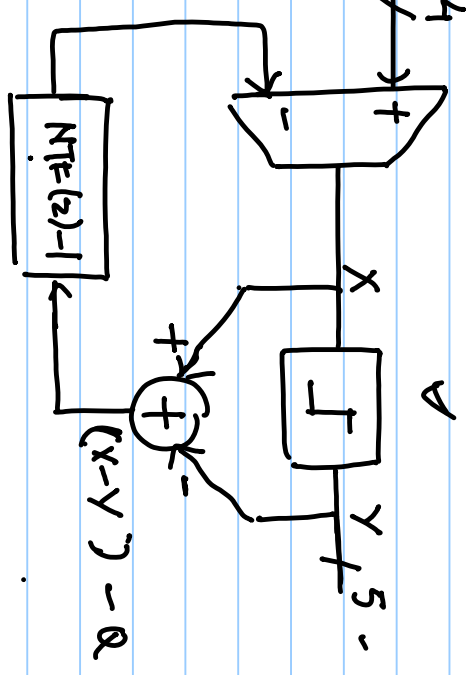


$$I_{LSB} = \frac{1 \text{ mA}}{2^{14}} = \frac{10^{-3}}{16384} \approx \frac{10^{-3}}{20000} = 0.5 \times 10^{-9} = 56 \text{ nA}$$





$$1 - z^{-1} = -z^{-1}$$

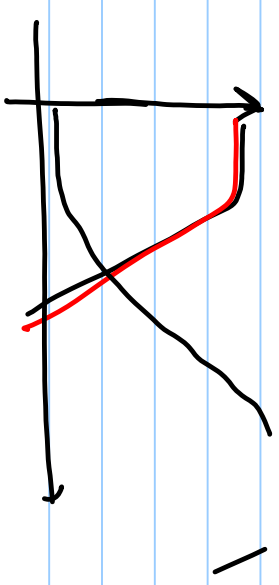


$$Y = U + \text{NTF}(z) \cdot Q$$

$$\text{NTF}(z) = (1 - z^{-1})$$

$$Y = U + (1 - z^{-1}) Q$$

$$U = \left[1000 + \frac{z^{-1}}{1 - z^{-1}} \right] \frac{1000}{8N} = Q$$



$$L_N = \frac{K_{CC0}}{sN} \left[I_{RBV} + \frac{k_{I \text{freq}}}{s} \right] = \frac{K_{CC0}}{s^2 N} \left[s \cdot \frac{I_{RBV}}{k_{I \text{freq}}} + 1 \right] k_{I \text{freq}}$$

$$\omega_2^2 = \frac{k_{I \text{freq}}}{I_{PV}} \quad , \quad \omega_{p1} = \omega_{p2} = 0$$

$$\omega_{ngp} = \frac{K_{CC0} \cdot I_{PV}}{N}$$

$$L_N \approx \frac{K_{CC0}}{s^2 N} \cdot \frac{s \cdot I_{RBV}}{\cancel{k_{I \text{freq}}}} \cdot \cancel{k_{I \text{freq}}}$$