

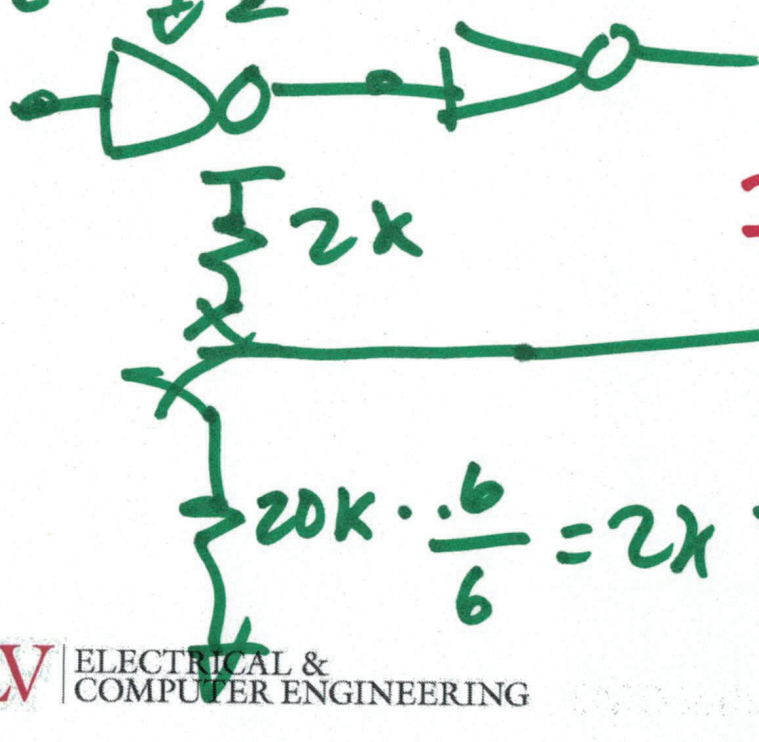
EE 421 / ECG 621

Digital IC Design



Lecture 18

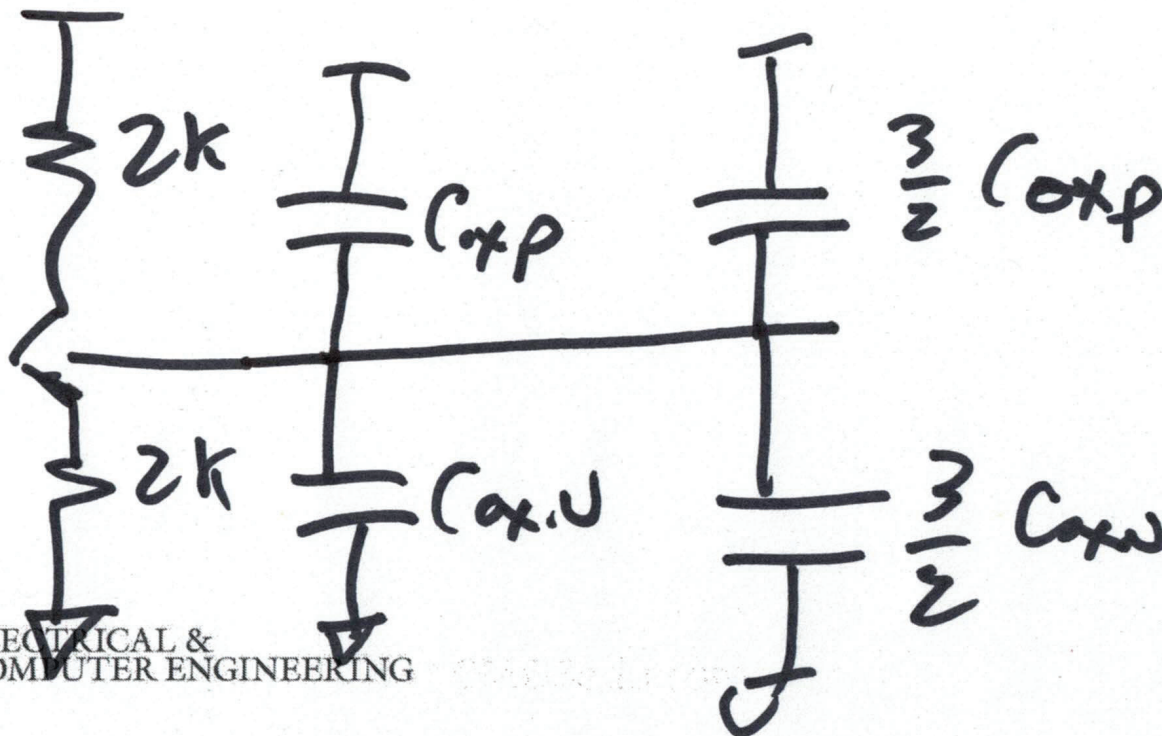
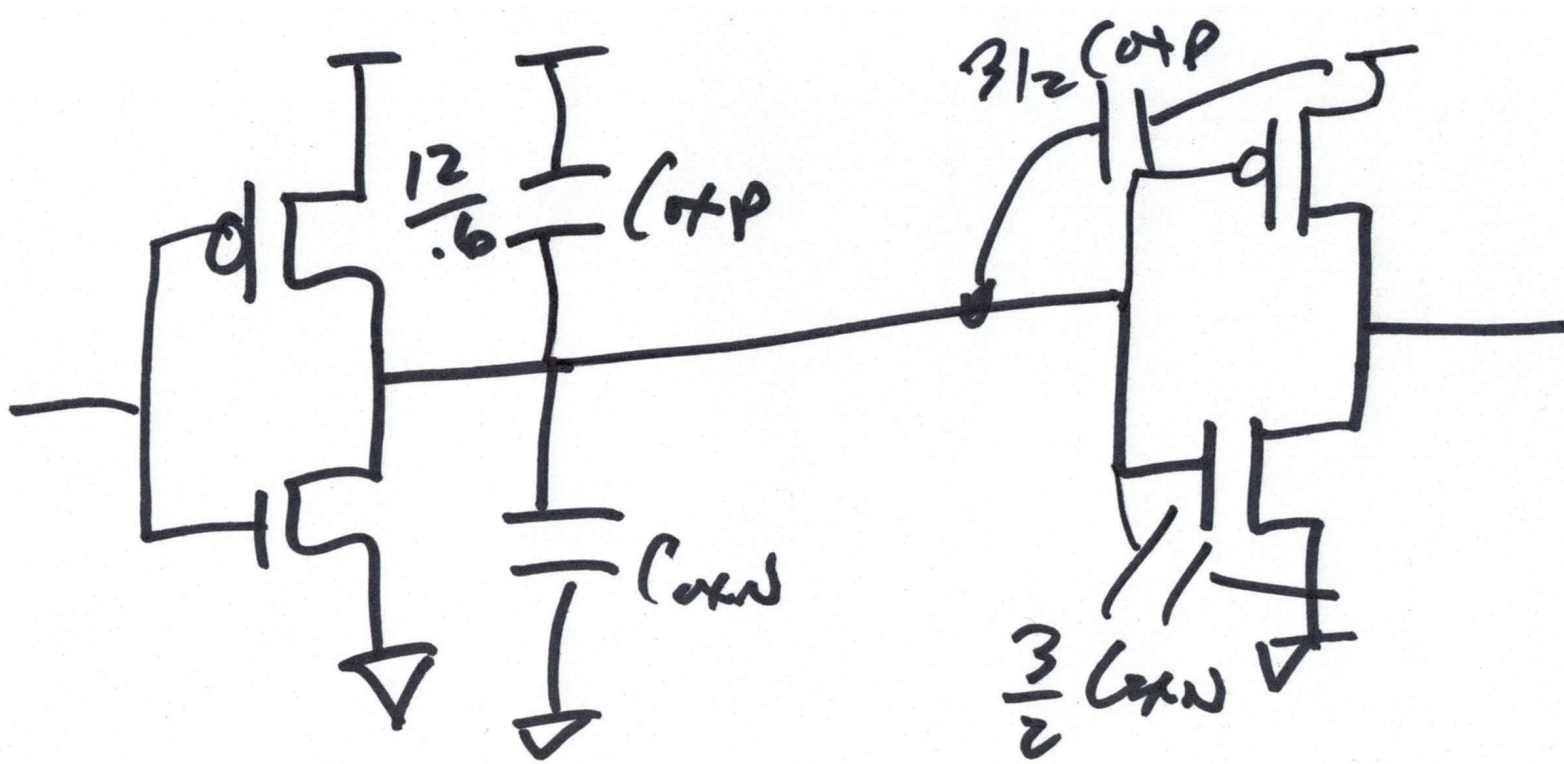
OCTOBER 28, 2020



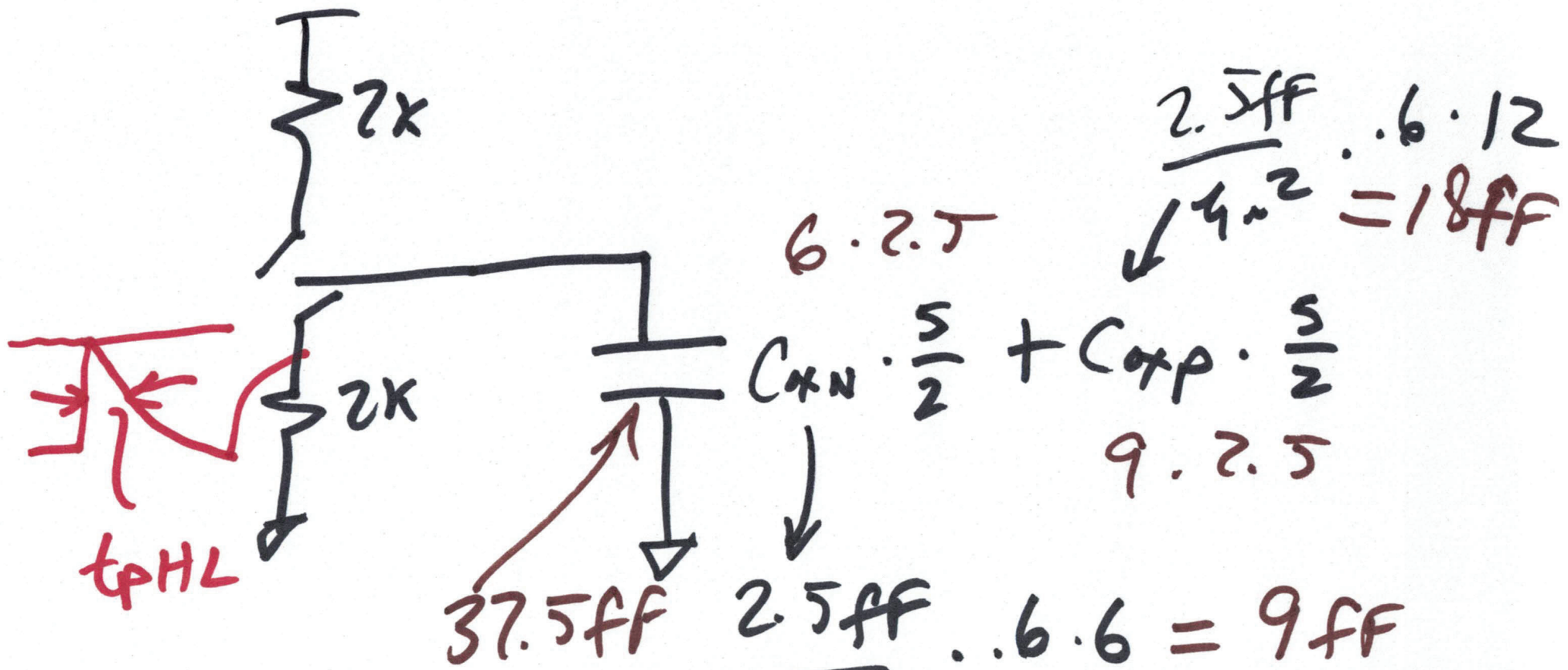
$$2.5 \frac{fF}{\mu m^2} (\cdot 6 \mu m \cdot 12 \mu m) \cdot 2.5$$

$$20k \cdot \frac{.6}{6} = 2k$$

$$(2.5 \frac{fF}{\mu m^2} \cdot .6 \cdot .6) \left(1 + \frac{2.5}{2} \right)$$



2)



$$\frac{2.5 \text{ fF}}{\sqrt{4.2^2}} \cdot .6 \cdot 12 = 18 \text{ fF}$$

$$C_{oxN} \cdot \frac{5}{2} + C_{oxP} \cdot \frac{5}{2}$$

$$9 \cdot 2.5$$

$$\frac{2.5 \text{ fF} \cdot .6 \cdot 6}{4.2^2} = 9 \text{ fF}$$

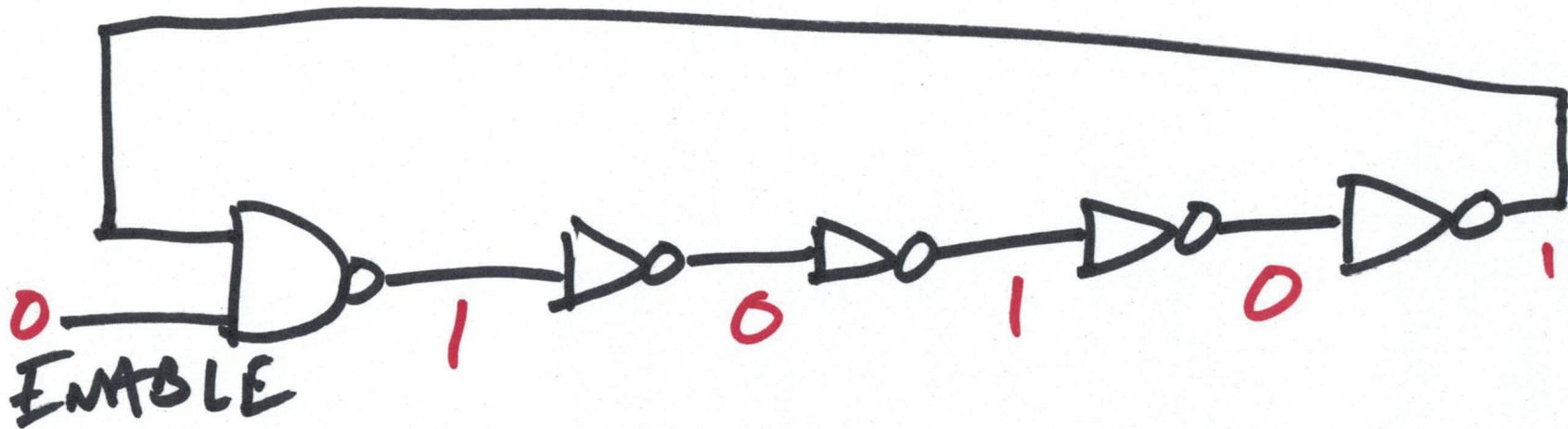
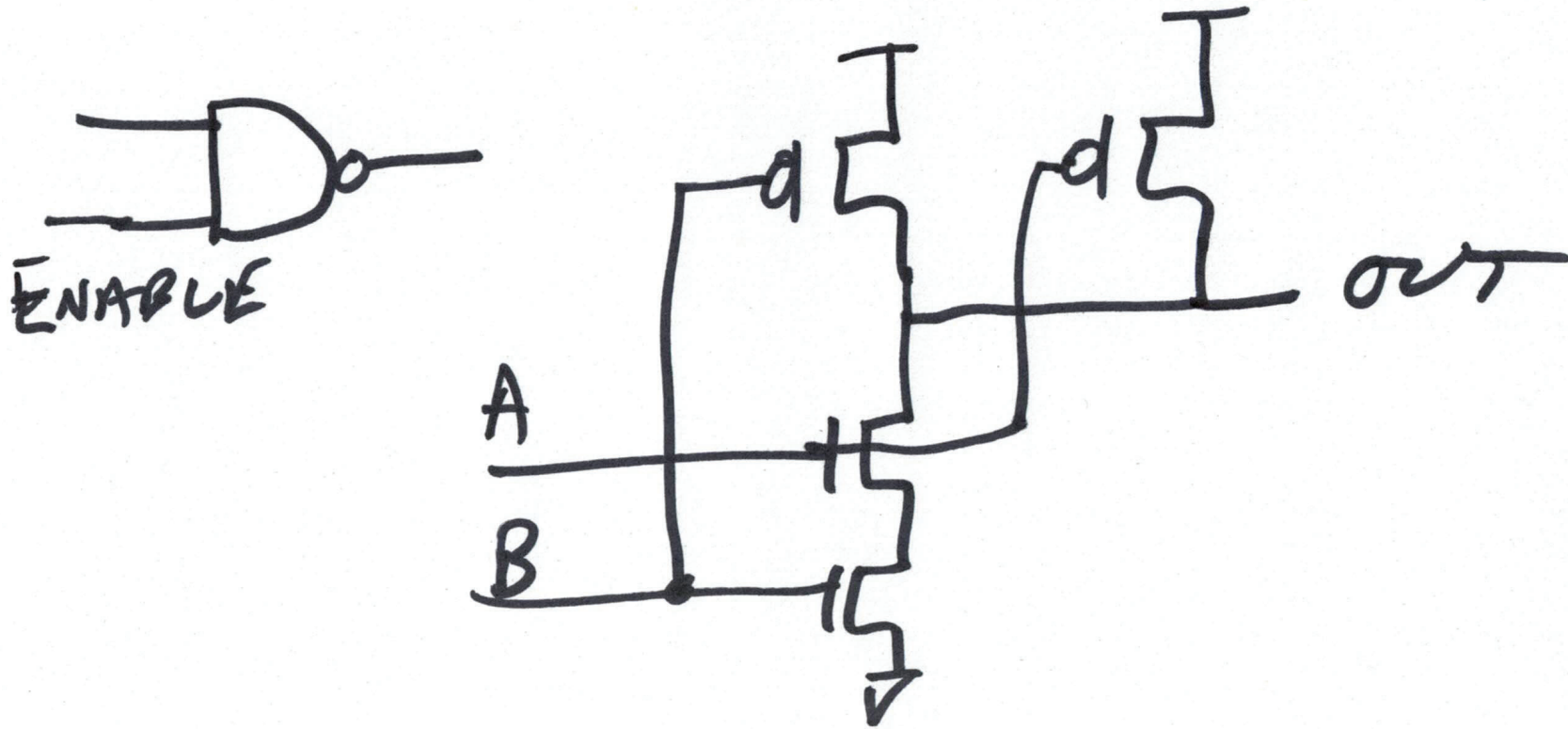
$$C_x' \cdot L \cdot W$$

$$t_{PHL} = 0.7 \cdot 37.5 \text{ fF} \cdot 2k = 50 \text{ ps}$$

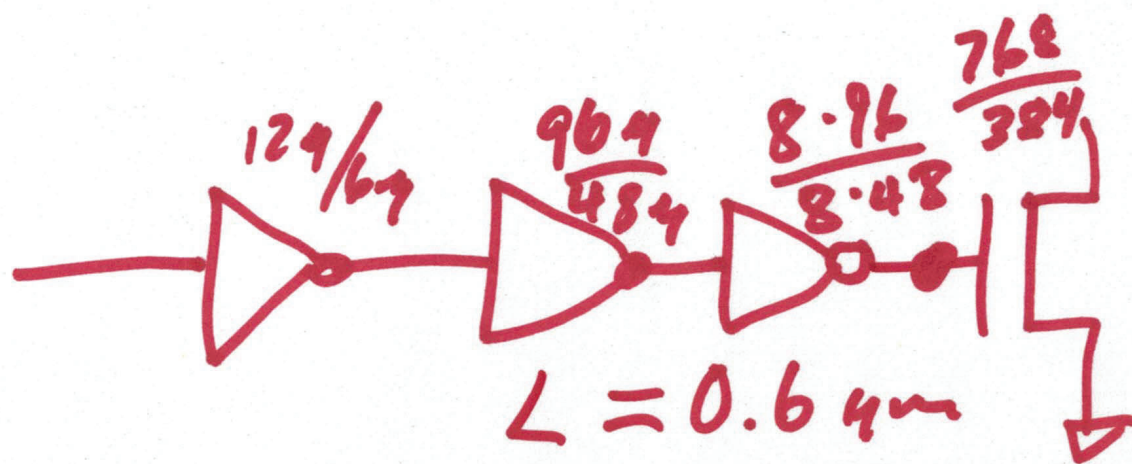
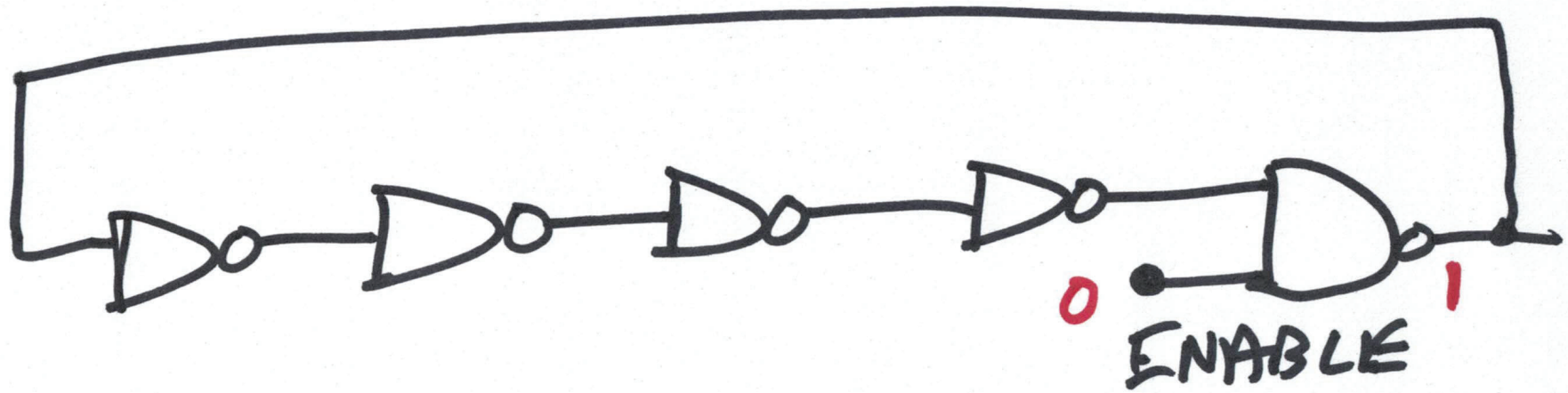
$$t_{PLH} = 0.7 \cdot R_p \cdot 37.5 \text{ fF} = 50 \text{ ps}$$

3)

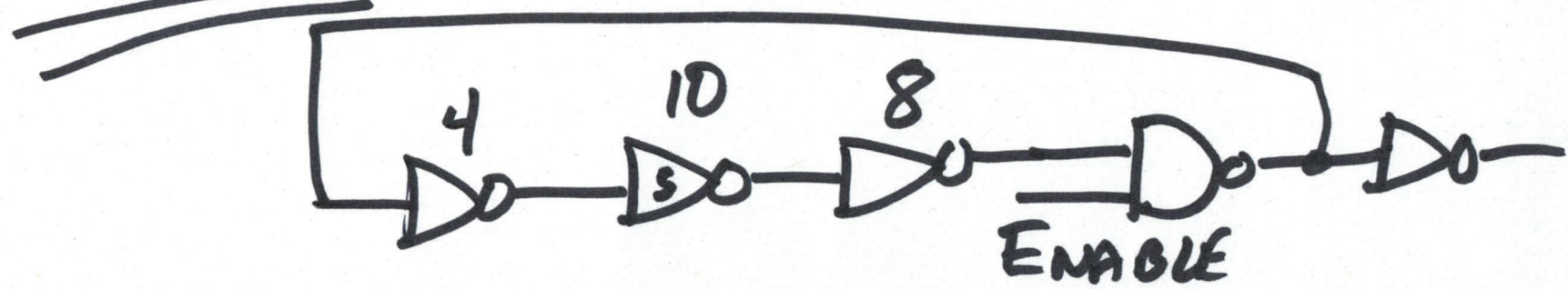
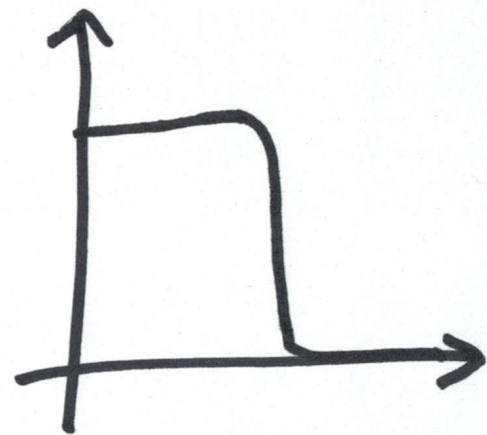
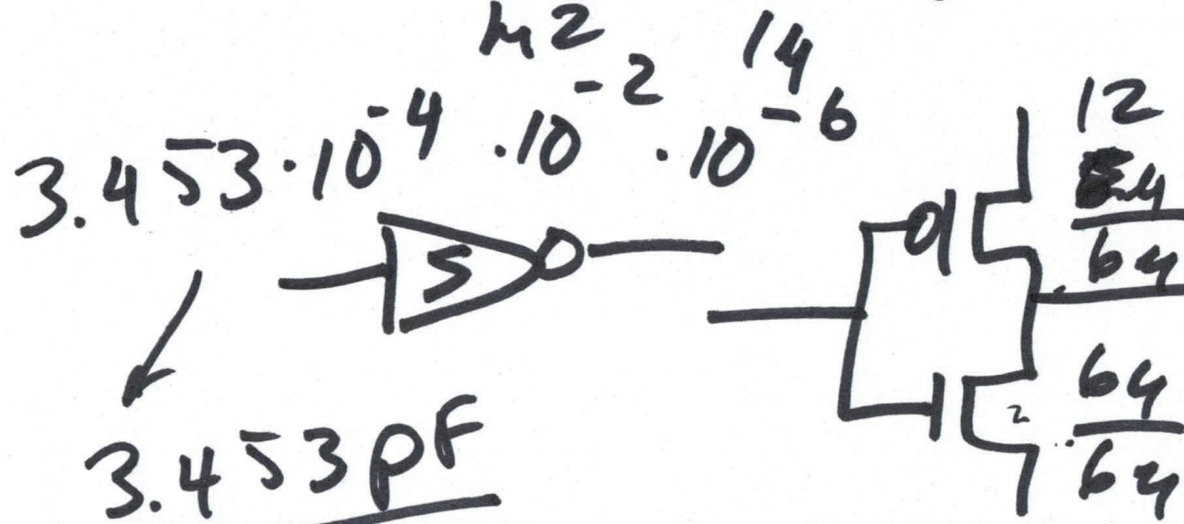
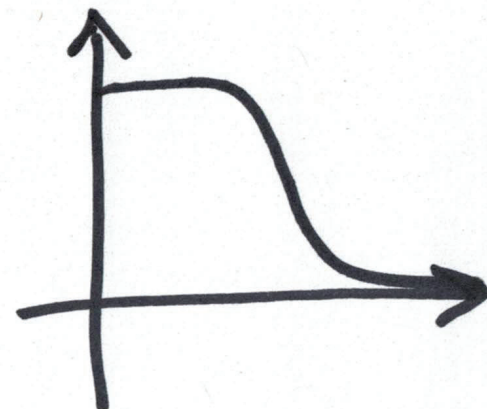
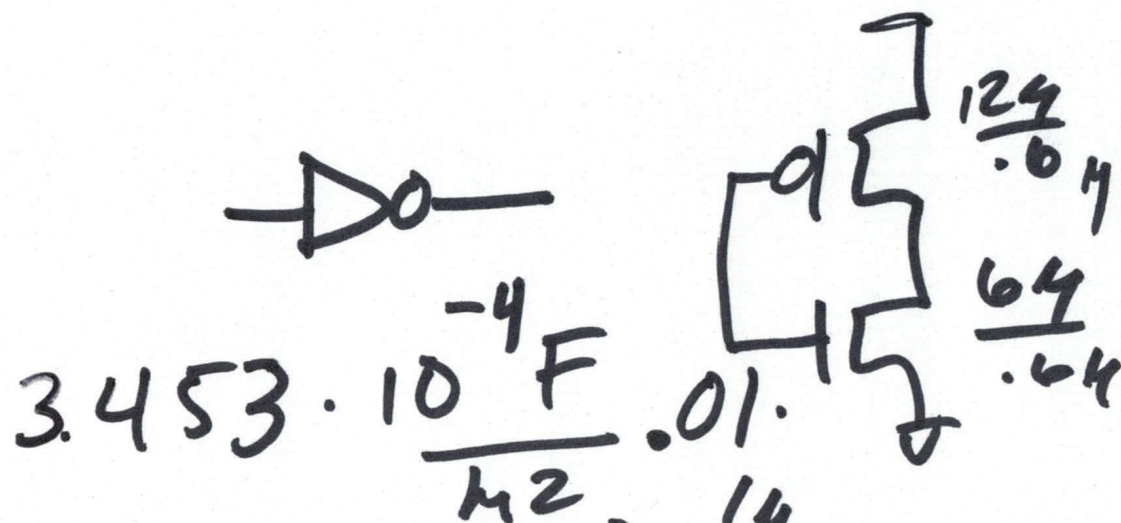
$$\begin{aligned} f_{osc} &= \frac{1}{N \cdot (t_{pLH} + t_{pHL})} \\ &= \frac{1}{51 \cdot (50ps + 50ps)} \\ &= 196MHz \end{aligned}$$



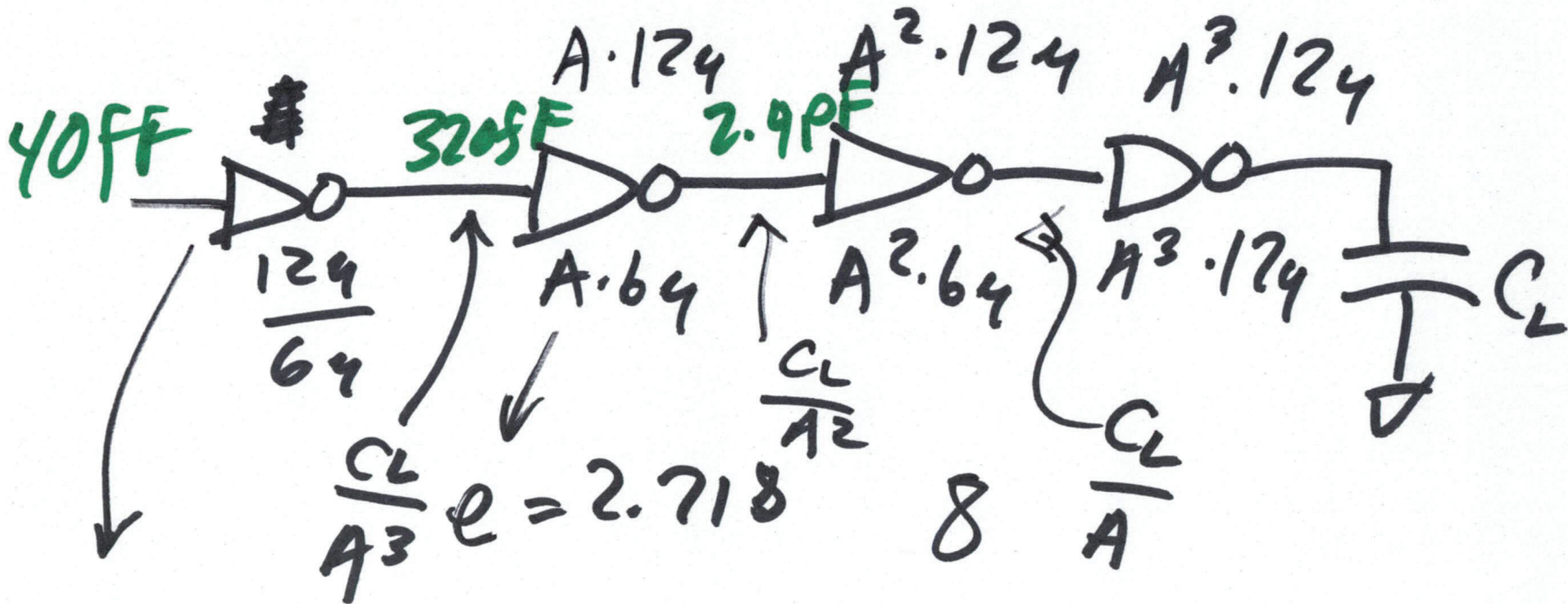
5)



b)



7)



$$C_{inN} = \frac{3}{2} C_{oxN} + \frac{3}{2} C_{oxP}$$

$$= \frac{3}{2} \underbrace{2.5\text{ff} \cdot 6 \cdot 6}_9 + \frac{3}{2} \underbrace{2.5\text{ff} \cdot 6 \cdot 12}_{18}$$

$$\underbrace{\hspace{15em}}_{27}$$

8)

13.5 ~ 40ff

