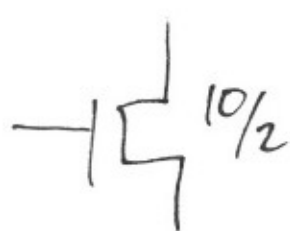


Extra lecture 4/2/09

CS process

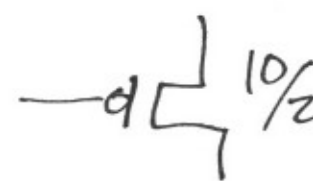
$$R_w' = 25k, R_d' = 50k$$

$$C_{ox}' = 2.5 \text{ fF}/\mu\text{m}^2, \lambda = 300\text{nm}$$



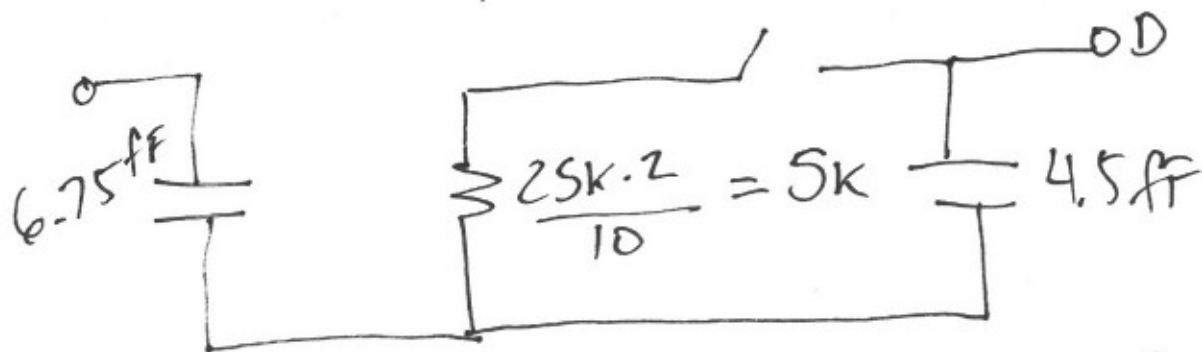
$$C_{INN} = \frac{3}{2} C_{ox} = 6.75 \text{ fF}$$


$$C_{OUTN} = 4.5 \text{ fF}$$



$$C_{INP} = 6.75 \text{ fF}$$

$$C_{OUTP} = 4.5 \text{ fF}$$



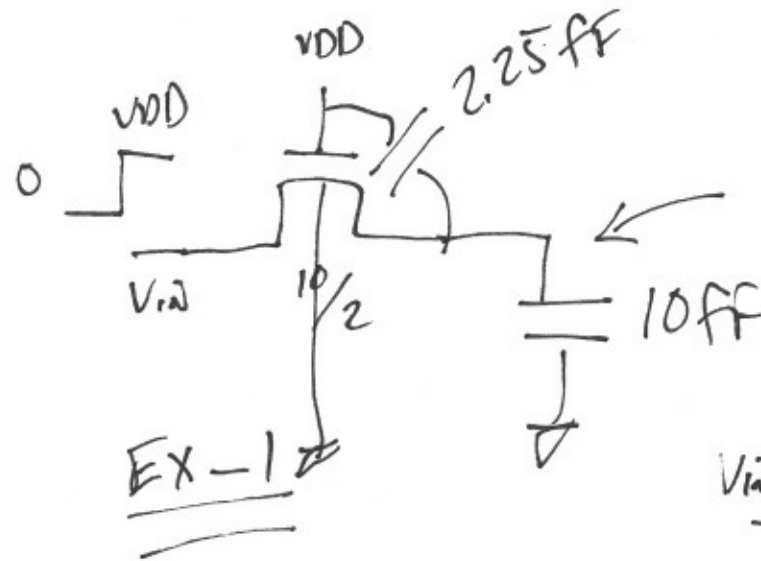


$$\frac{50k \cdot 2}{10} = 10k$$

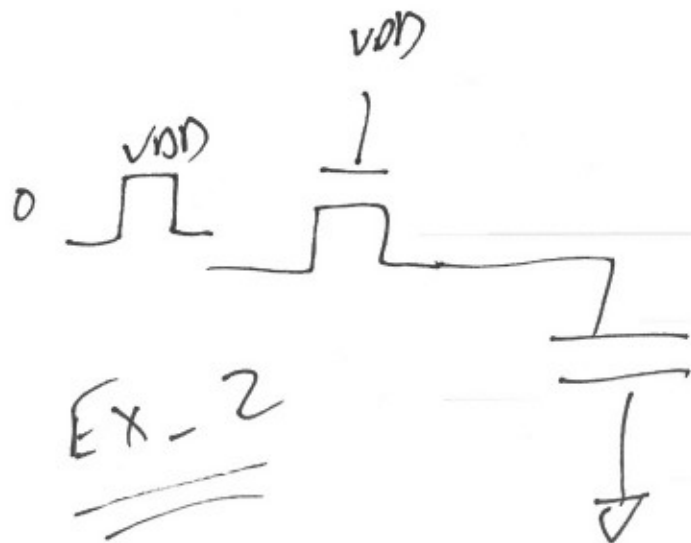
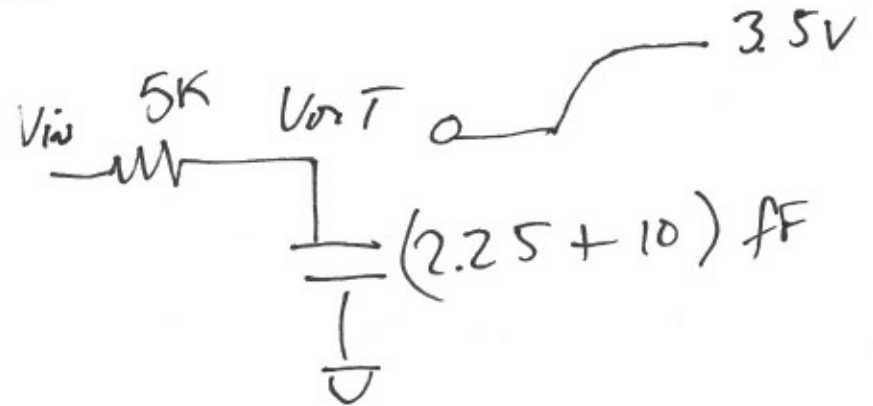
$$C_{oxN} = C_{ox}' \cdot L \cdot W \cdot \text{scale}^2$$

$$= \frac{2.5 \text{ fF}}{\mu\text{m}^2} \cdot 2 \cdot 10 \left(\frac{0.3 \mu\text{m}}{1 \mu\text{m}} \right)^2 = 4.5 \text{ fF} = C_{oxP}$$

1
(1/2)

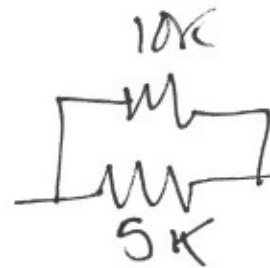
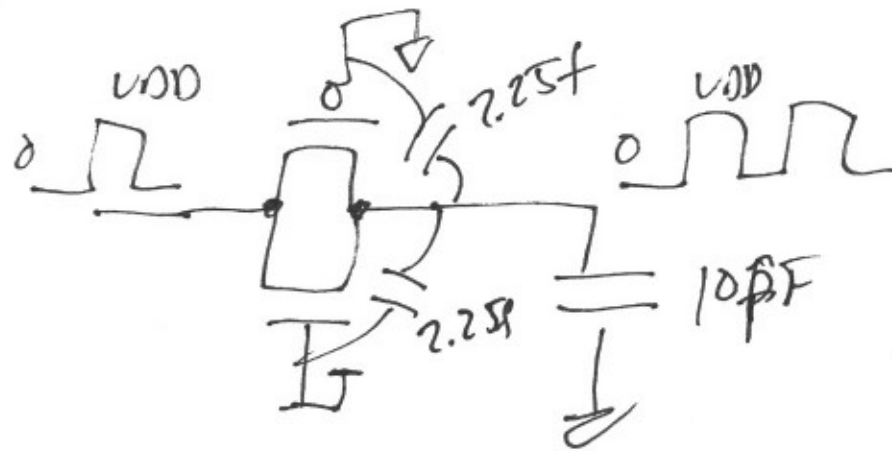


$$t_{PHL} = t_{PLH} = 0.7 \cdot 5K \cdot 12.25fF = 4.3ps$$



same delay





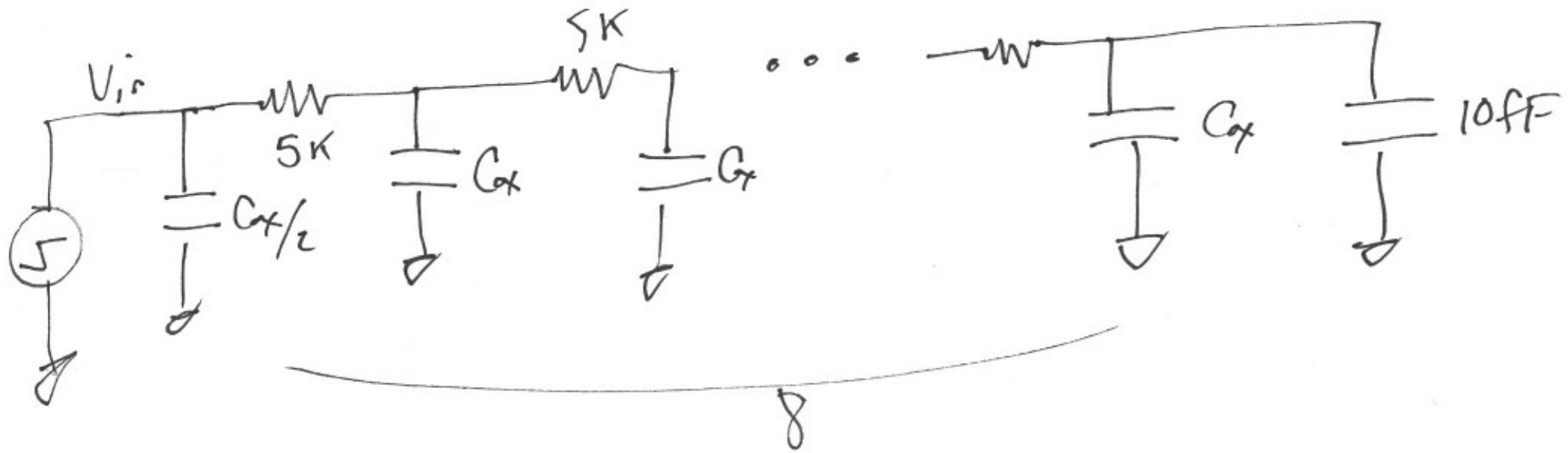
EX-3

$$10\text{pF} + 2.25\text{f} + 2.25\text{f} = 14.5\text{f.F}$$

$$t_{PHL} = t_{PLH} = 0.7 (5\text{K} || 10\text{K}) (14.5\text{f.F})$$

$$\underline{\underline{24.2\text{ps}}}$$

3)



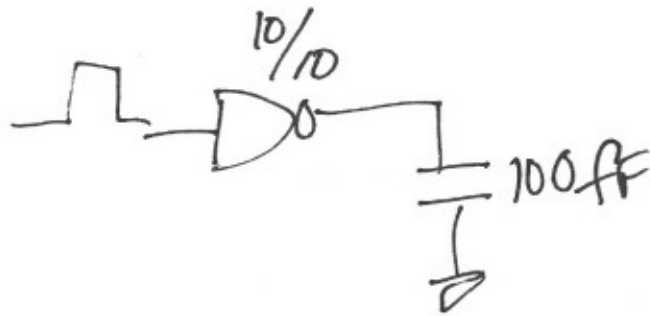
$$t_{PHL} = t_{PLH} = 0.35 \cdot 5k \cdot 4.5ff \cdot 8^2 + 0.7 \cdot 8 \cdot 5k \cdot 10ff$$

Ex-4

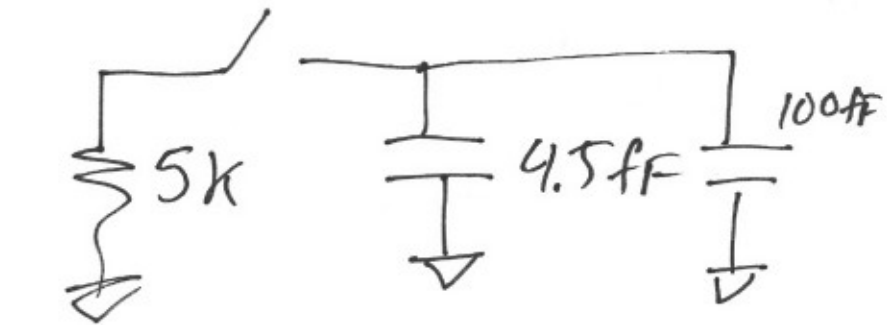
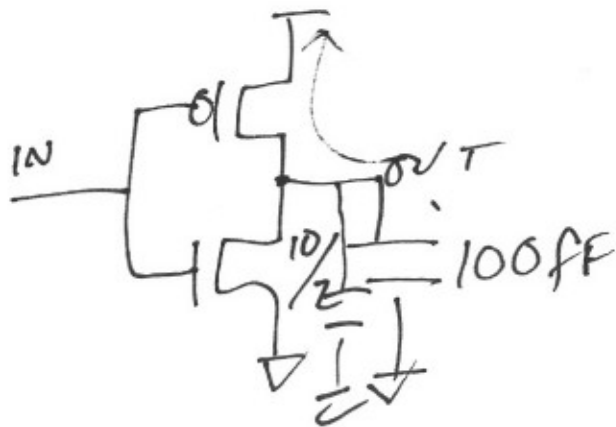
$$= 500ps + 280ps$$

$$= \underline{\underline{780ps}}$$

4)

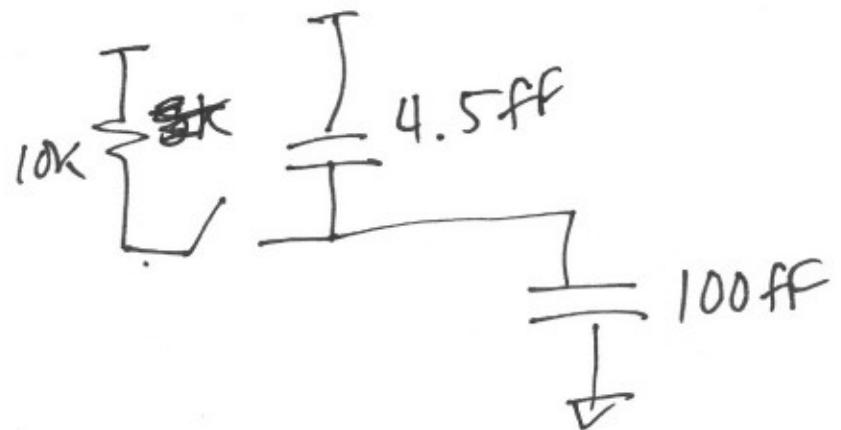


$$\begin{aligned}
 t_{PHL} &= R_N \cdot 0.7 (C_{int} + C_L) \\
 &= 0.7 \cdot 5k \cdot (104fF) \\
 &= 400 ps
 \end{aligned}$$

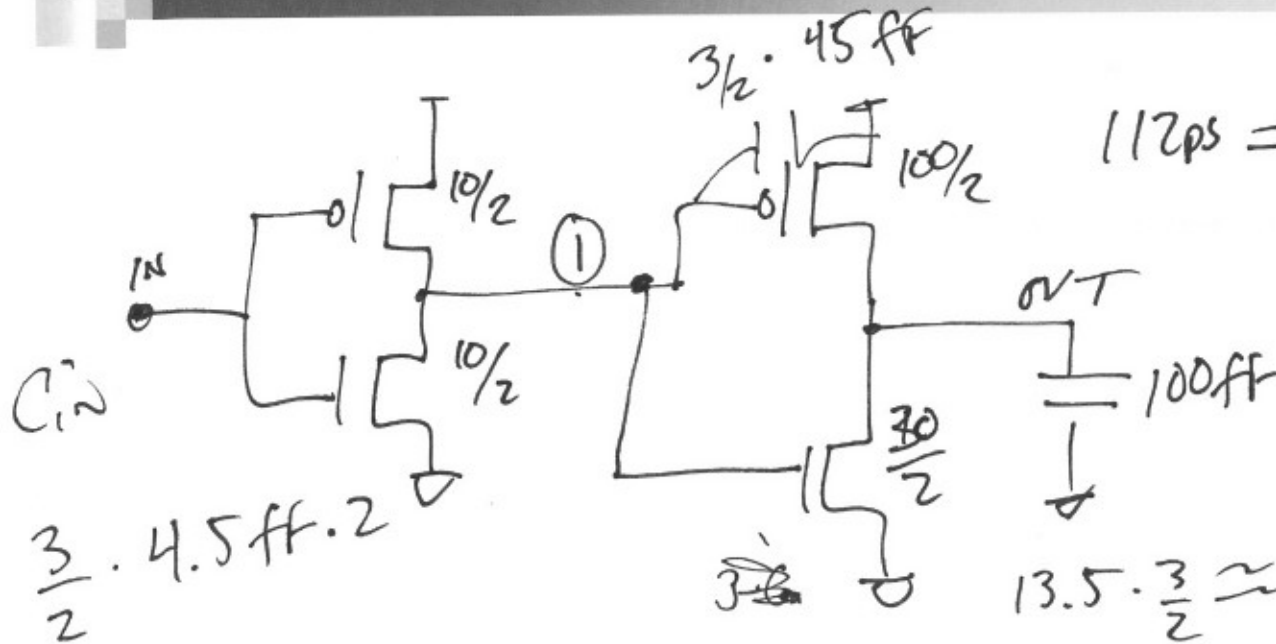


t_{PLH} EX-7

$$\begin{aligned}
 t_{PLH} &= 0.7 \cdot 10k \cdot (104ps) \\
 &\approx \underline{\underline{800ps}}
 \end{aligned}$$

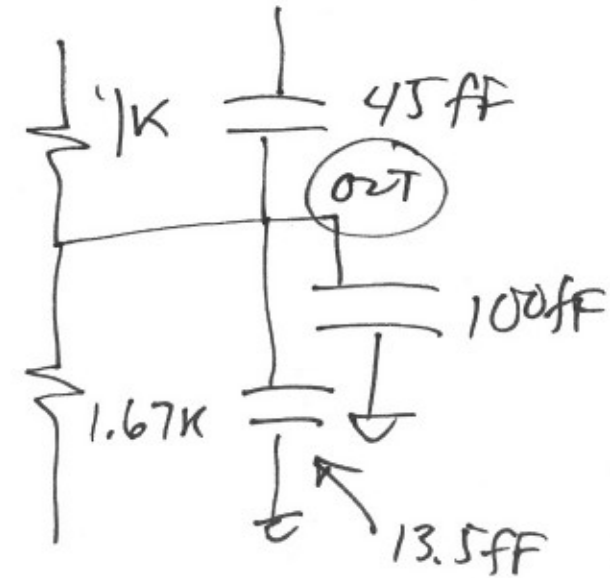
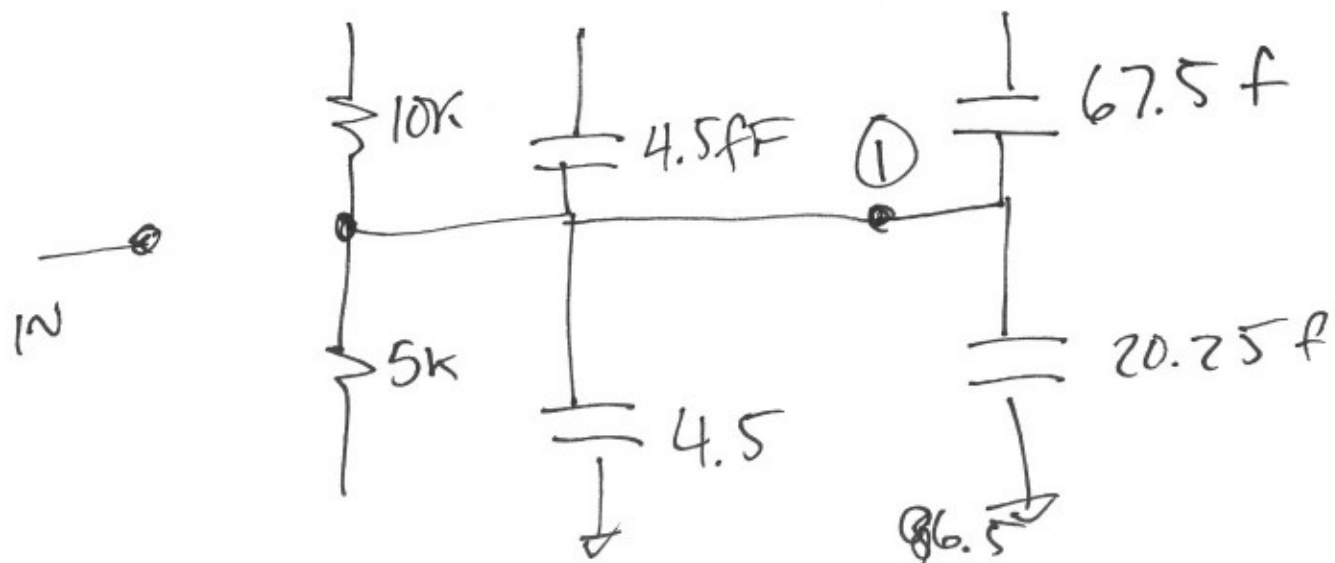


6)



$$112 \text{ ps} = t_{PLH} = 0.7 \cdot 1\text{k} \cdot 160 \text{ fF}$$

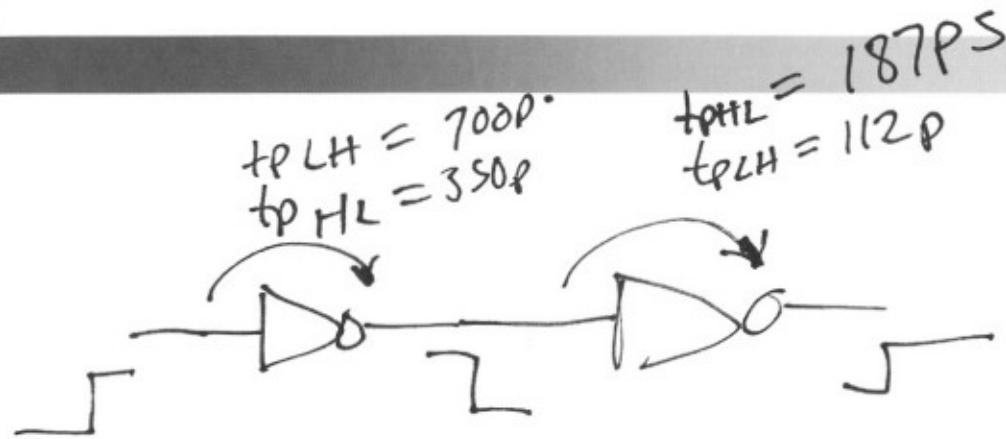
$$t_{PHL} = 0.7 \cdot 1.67\text{k} \cdot 160 \text{ fF} = \underline{\underline{187 \text{ ps}}}$$



$$t_{PHL} = 0.7 \cdot 5\text{k} \cdot (100 \text{ fF}) = 350 \text{ ps}, \quad t_{PLH} = 700 \text{ ps}$$

t_{node1}

7)



$$t_{pLH} = 350ps + 112ps$$
$$= 462ps$$

$$t_{pHL} = 700p + 187ps$$
$$= 887ps$$