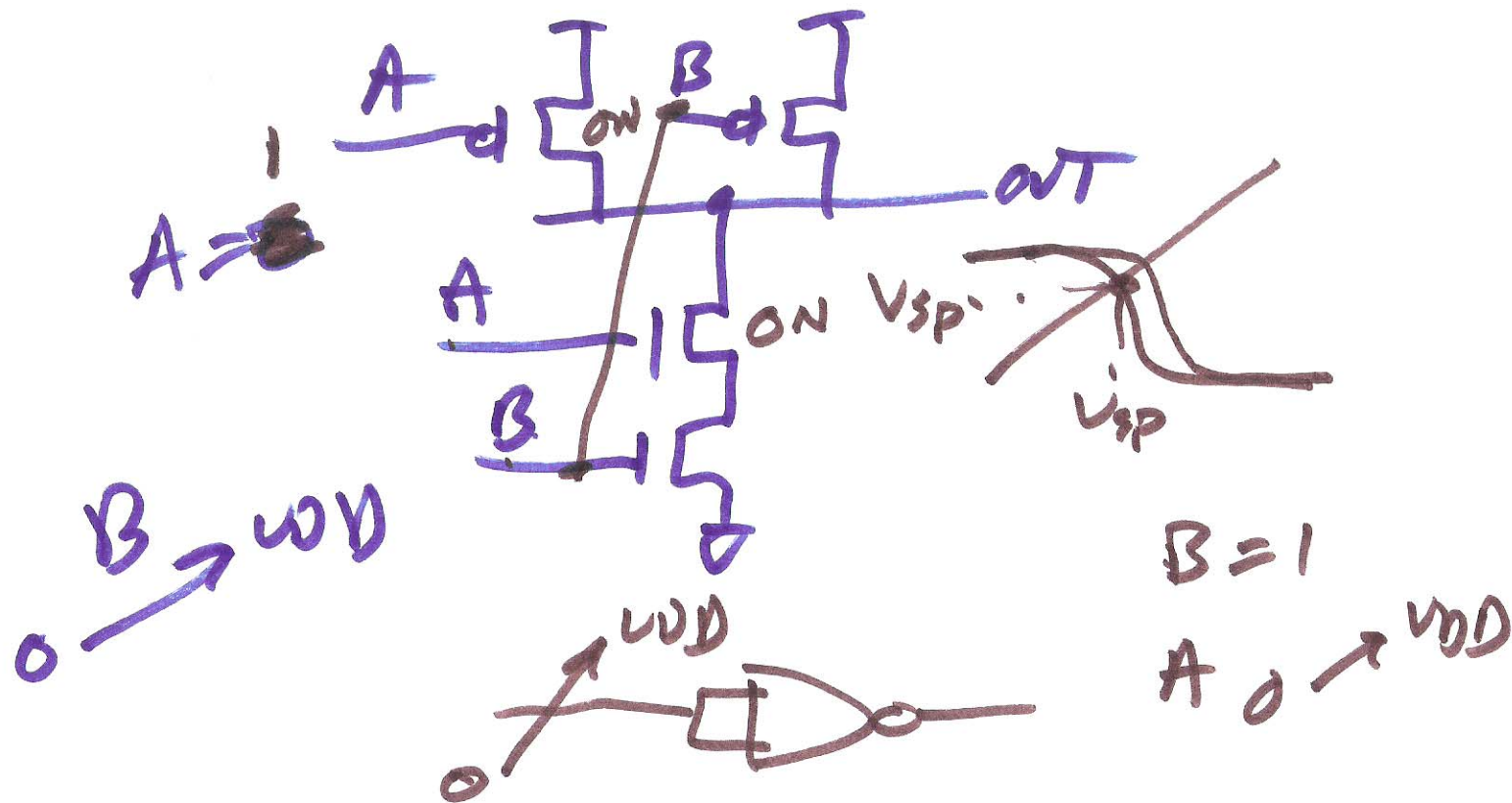
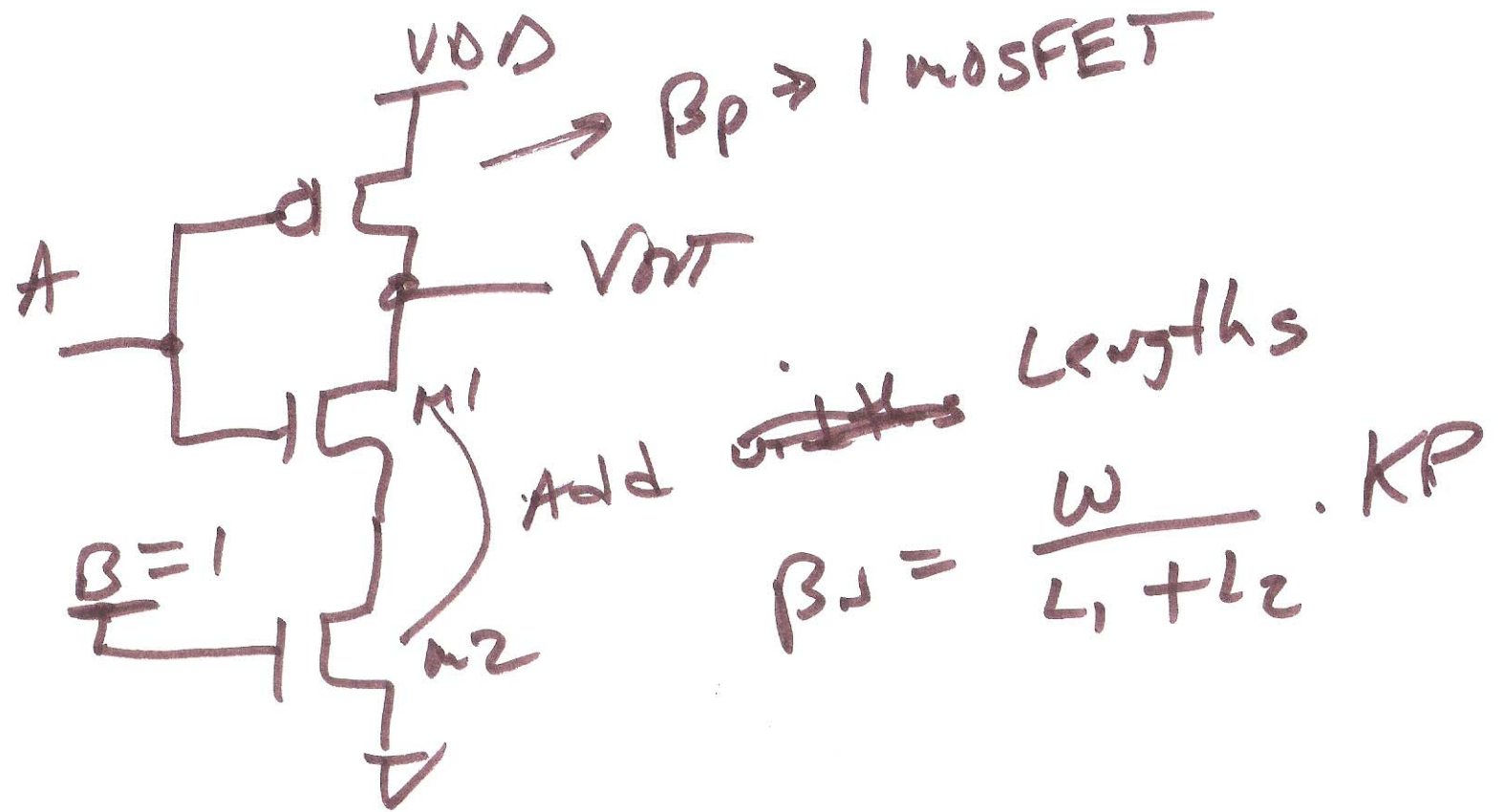


Lecture 23

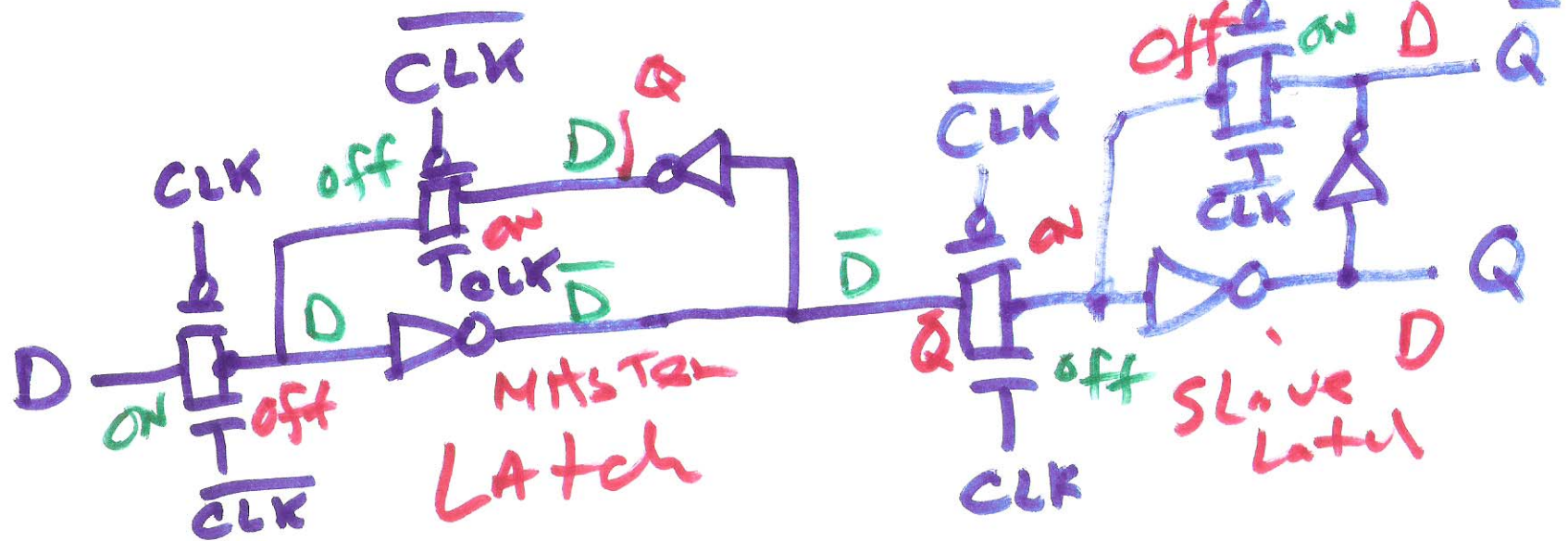
Nov. 20, 2013

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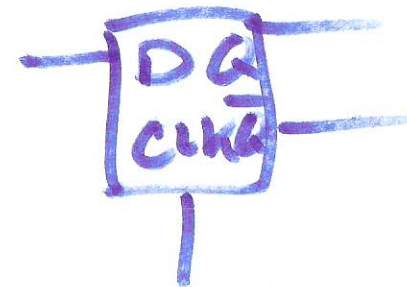




D-FF (Register)

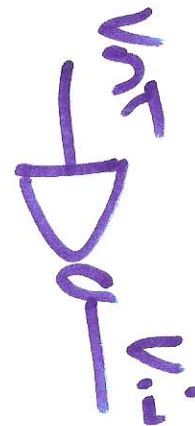
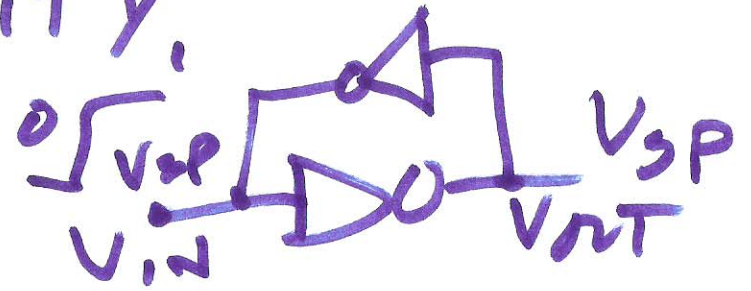
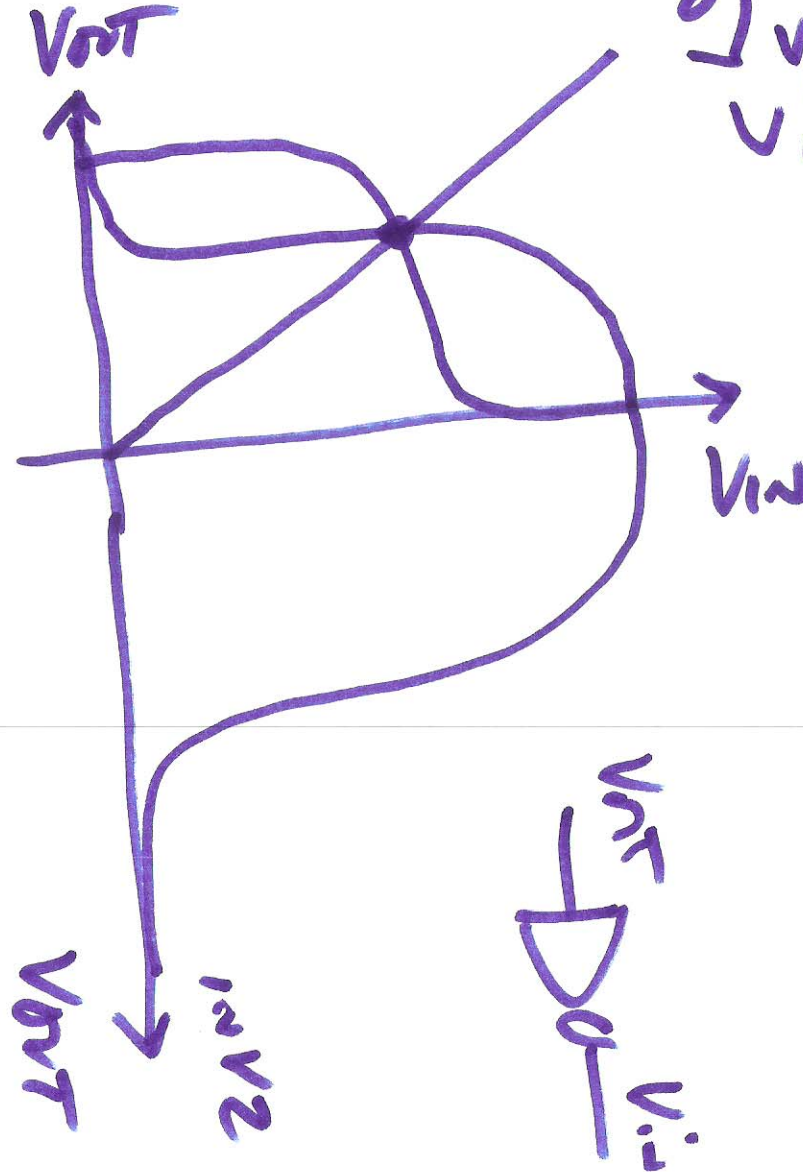


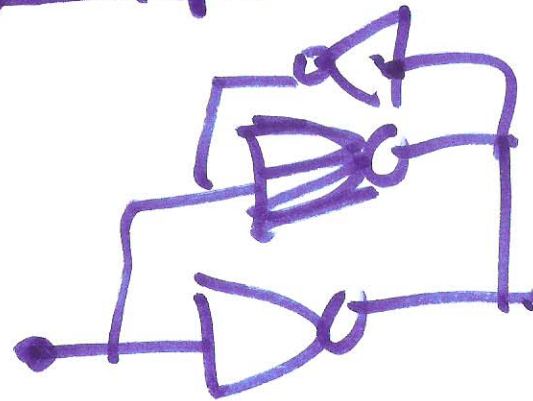
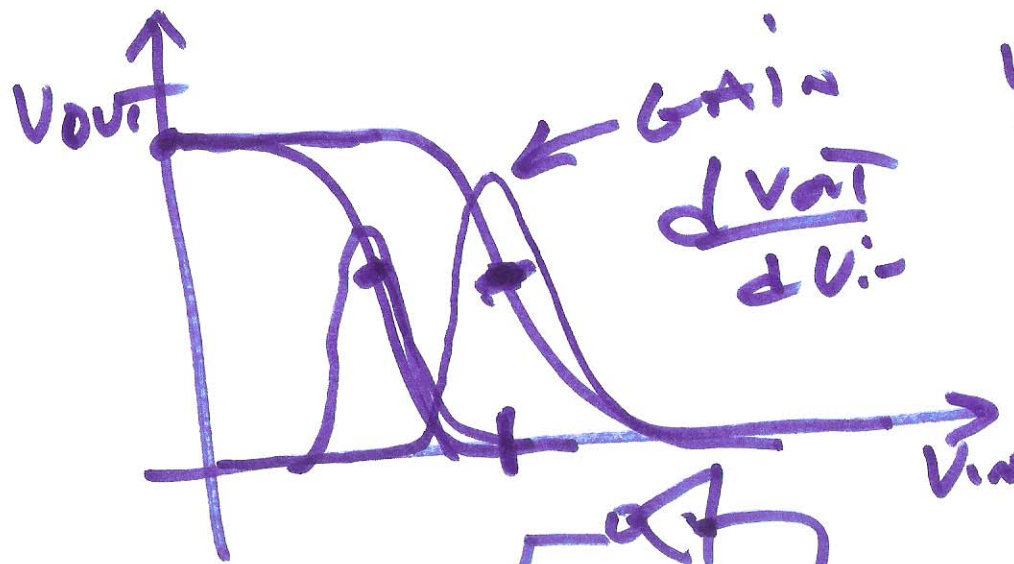
CLK = 0
CLK = 1



3)

Meta-stability.



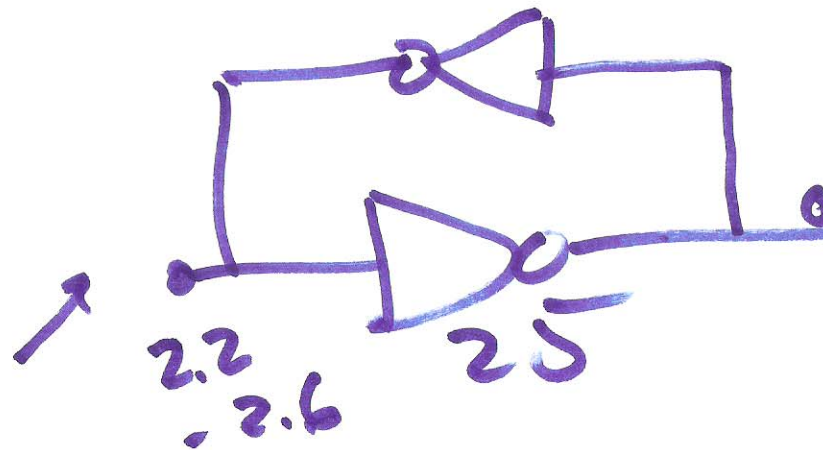
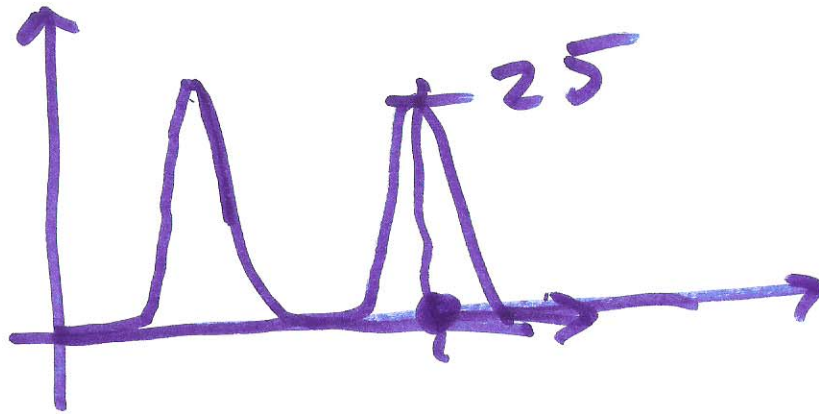


$$V_{in} \rightarrow \text{---} V_{out}$$

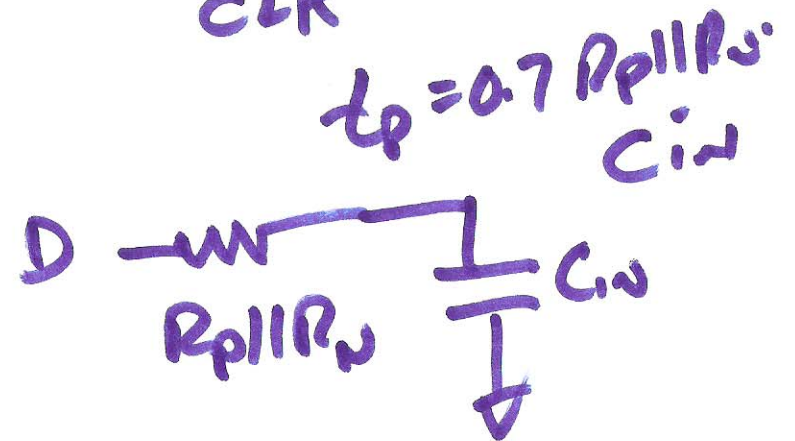
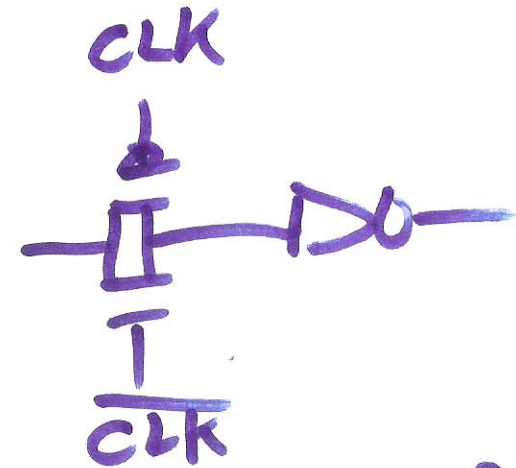
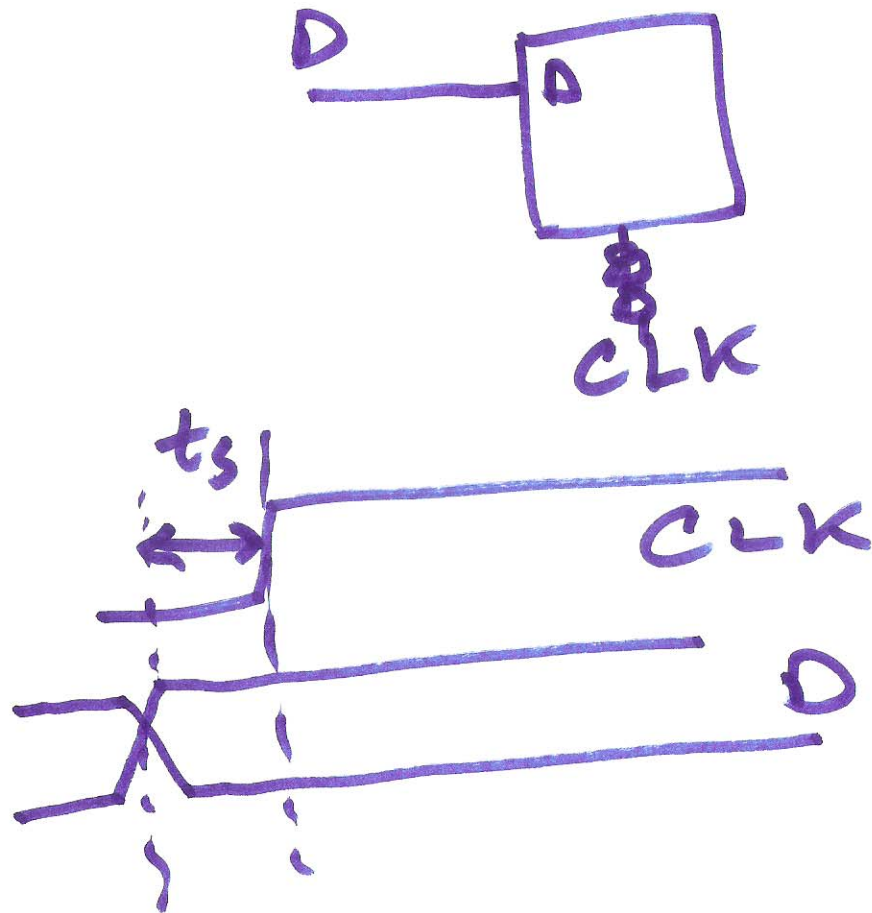
$$\frac{\Delta V_{out}}{\Delta V_{in}}$$

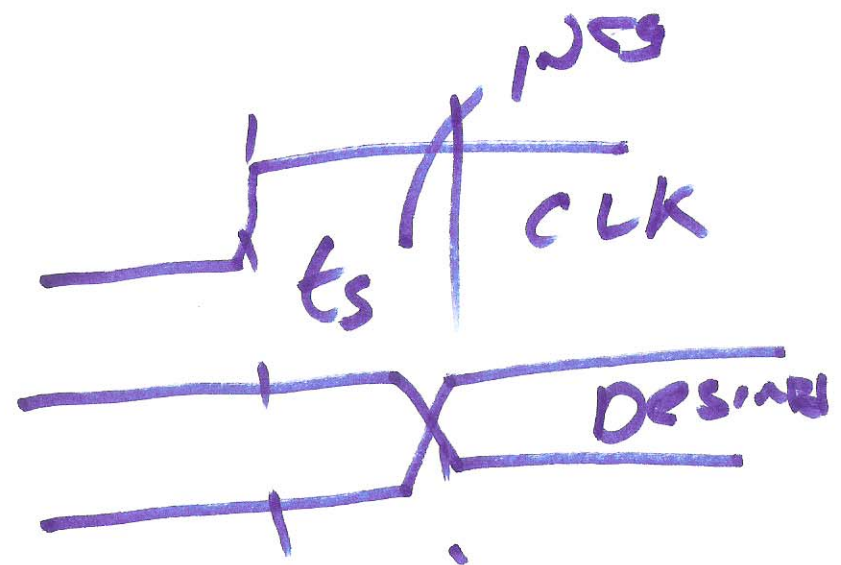
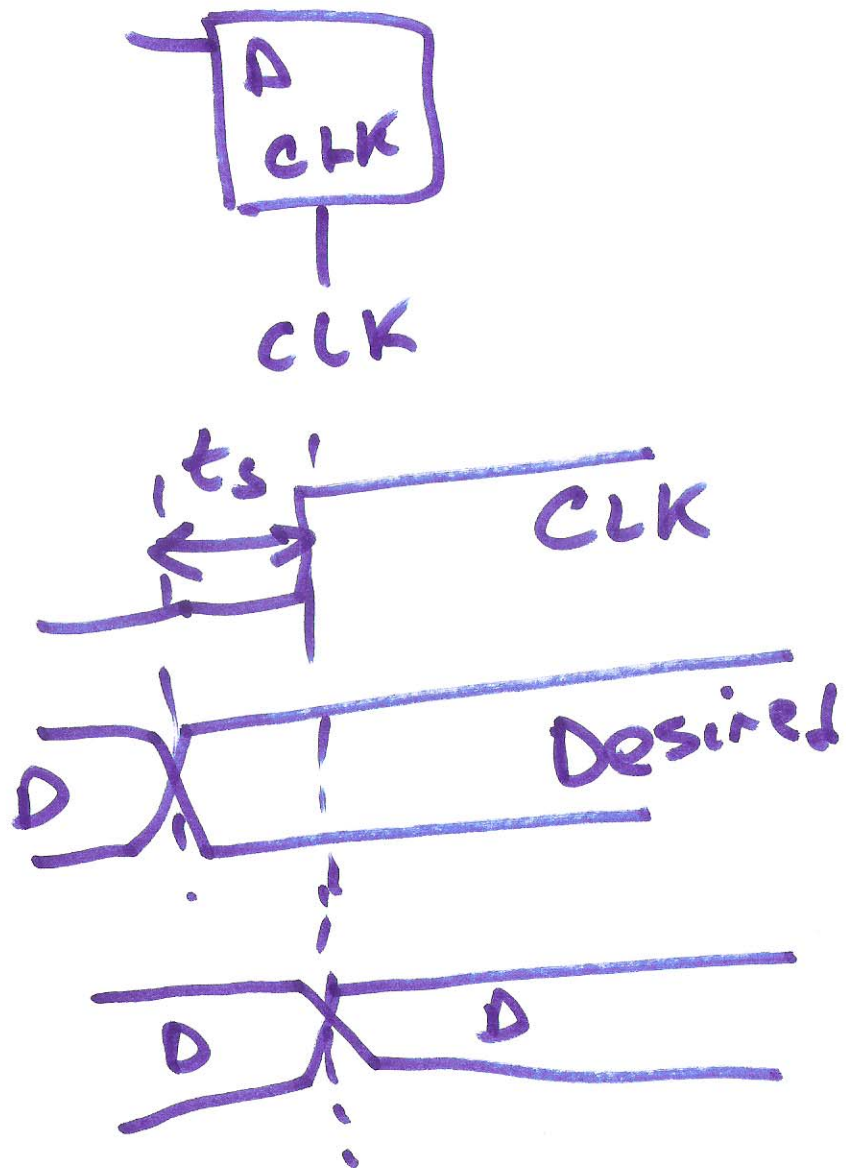
Σ

5)

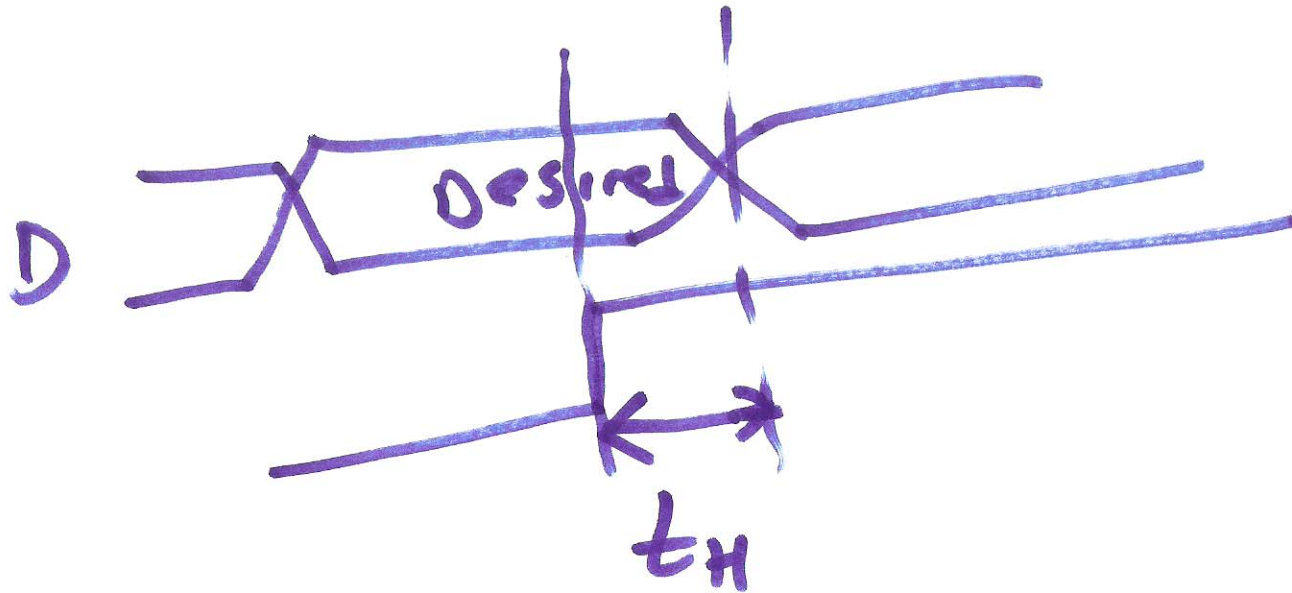
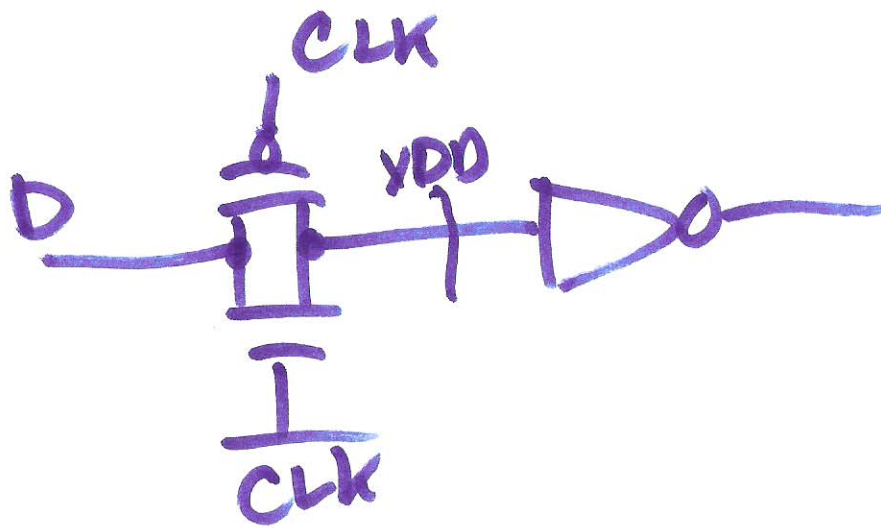


Setup time

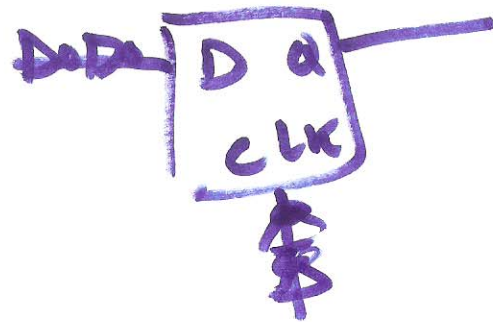
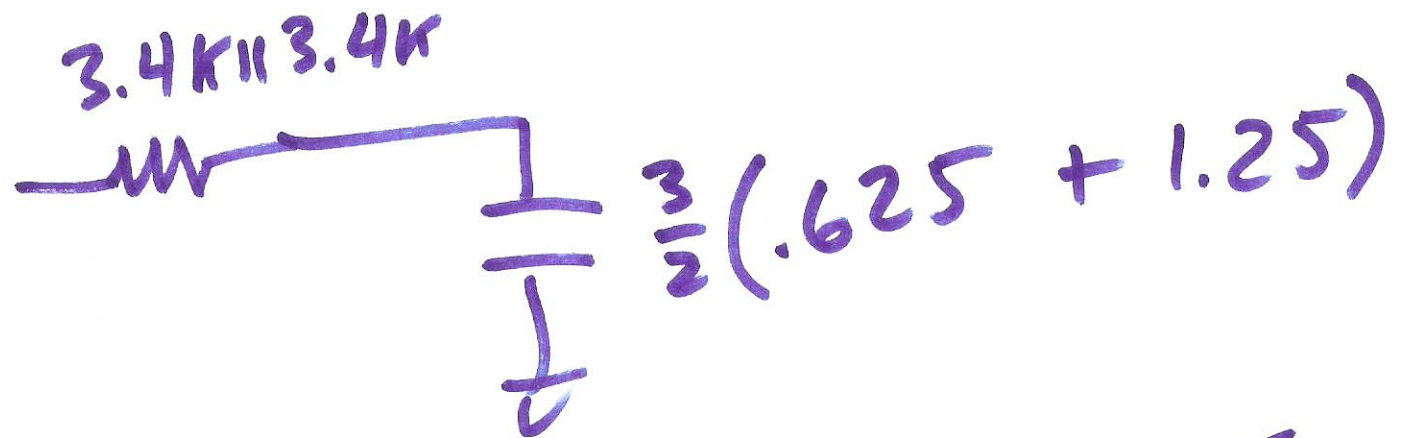




8)



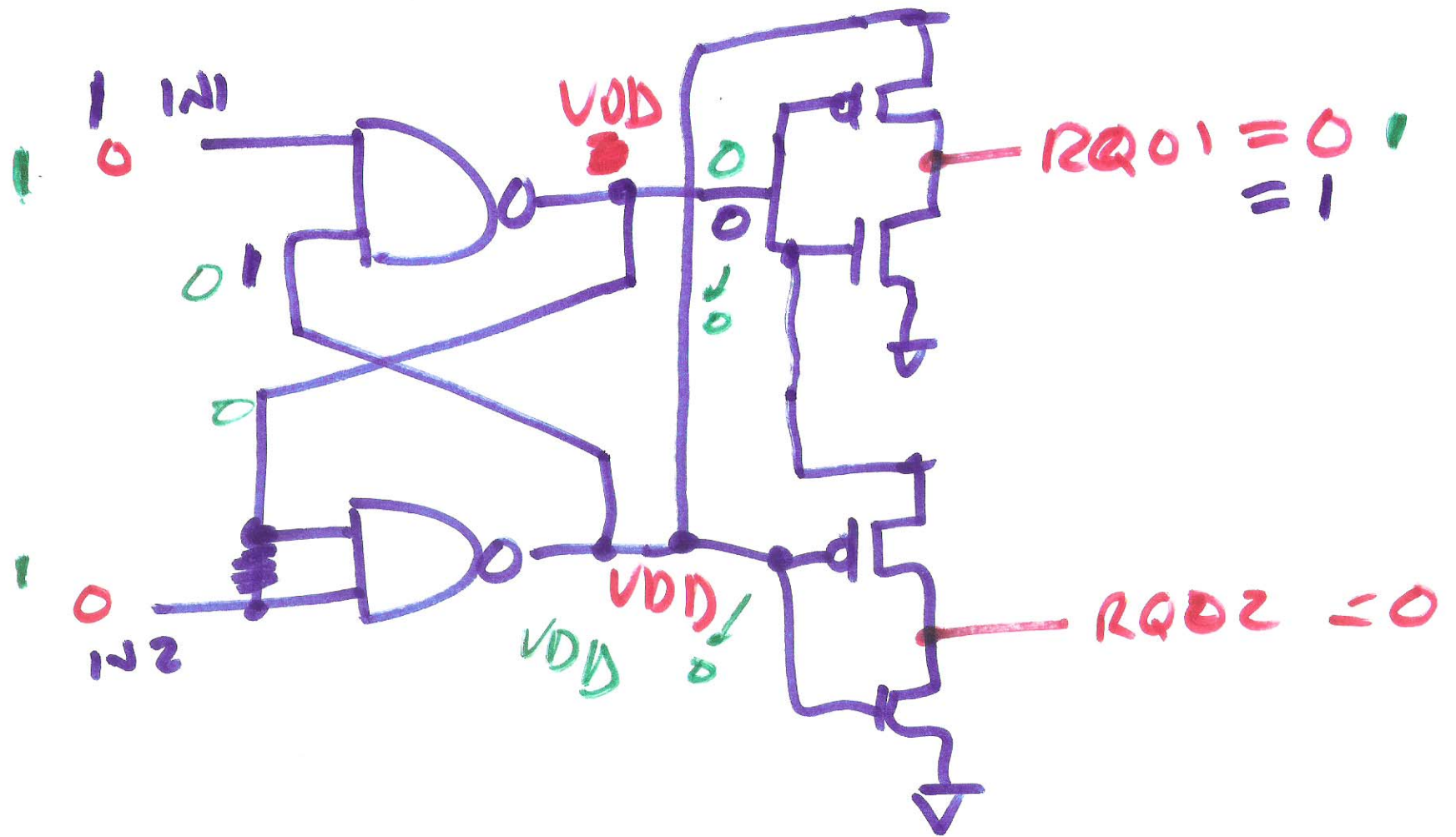
9)



pos.
pos. . t_H
 t_S

$$t_d = 1.7k \cdot 3f \cdot \frac{3}{2} = 5.1ps$$

25ps



11)