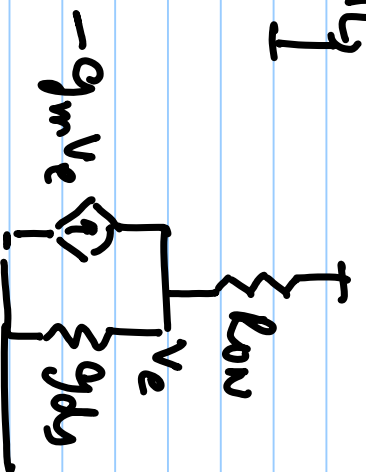
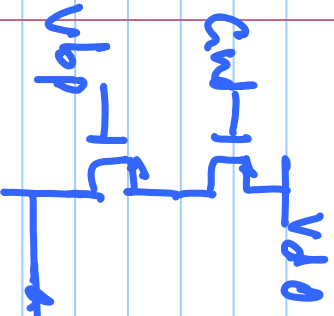
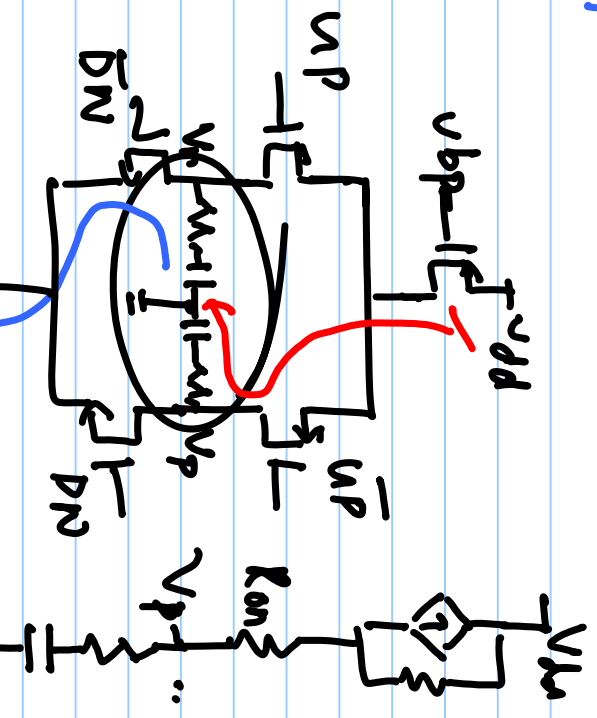
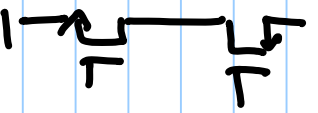
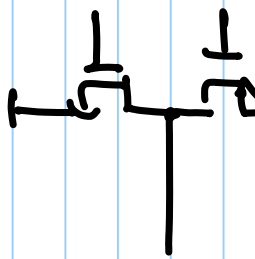
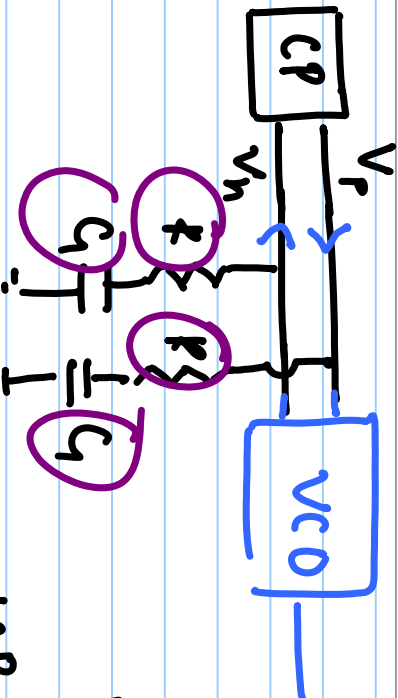
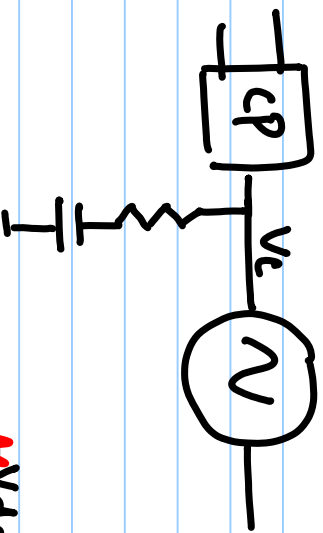
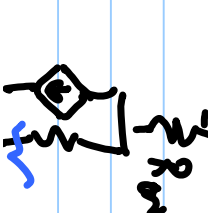


Lecture # 29

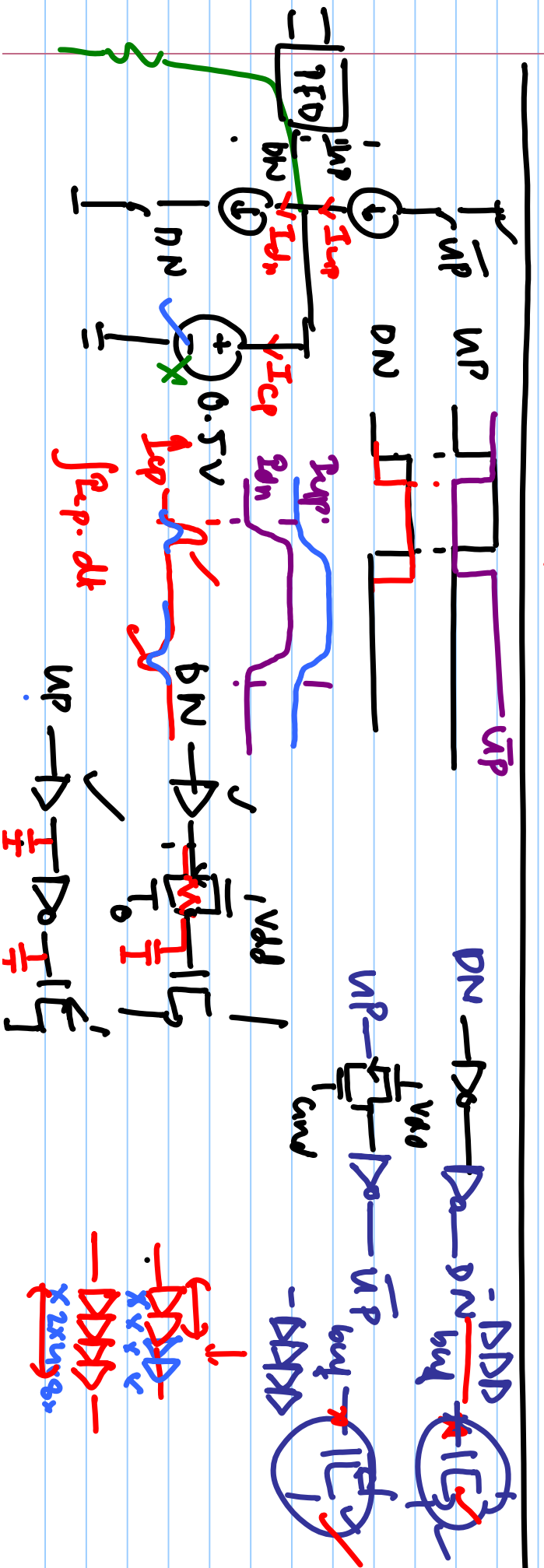
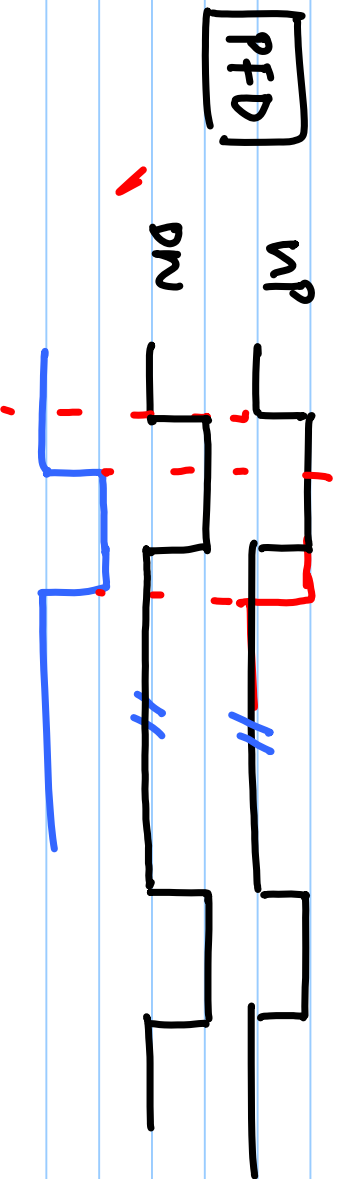


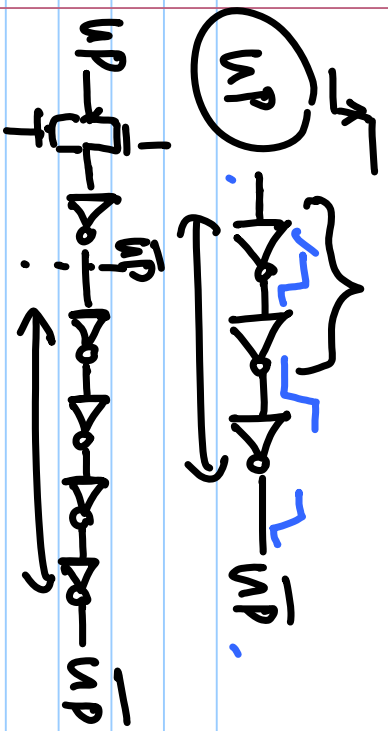
$$V_p - V_n = I_{cp} \left(2R + \frac{1}{sC/2} \right) = \frac{I_{cp} (1 + sRC)}{sC/2}$$

VDD noise $\rightarrow V_p - V_n$



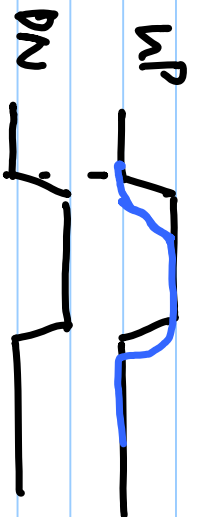
Single $V_{ctrl} = I_{cp}' \frac{(K_{sp} \sqrt{C})}{\Delta C} = I_{cp}' = 2 I_{cp}$



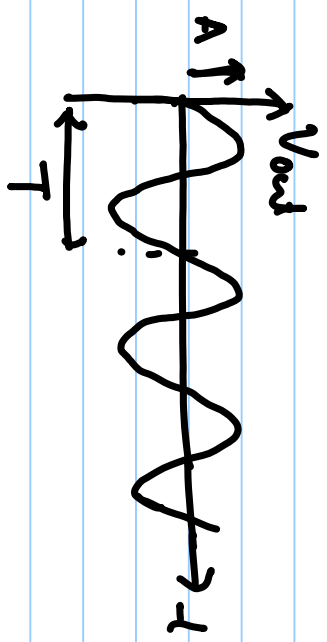
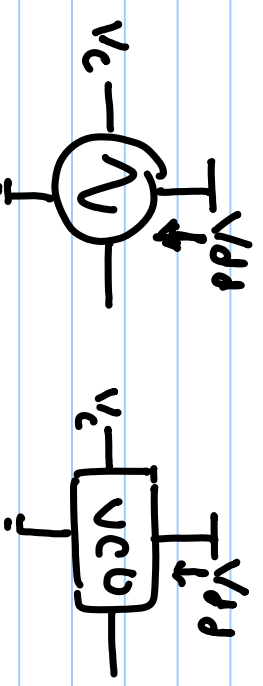
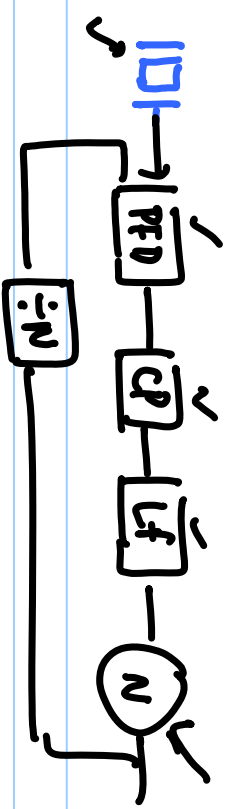


$$T_d = 2 t_d n m o_s + 1 t_d p m o_s \quad \checkmark$$

$$T_d = 2 t_d p m o_s + 2 t_d n m o_s \quad \checkmark$$



Oscillator.



\sim

i/p - V_c control voltage

V_{dd}/G_{nd} .

Crystal oscillator

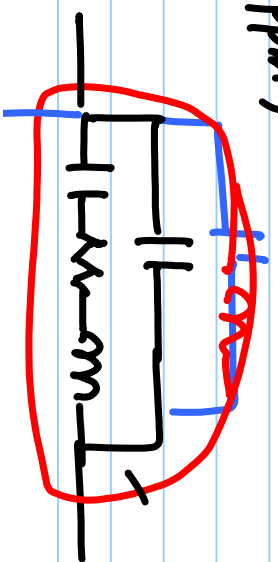
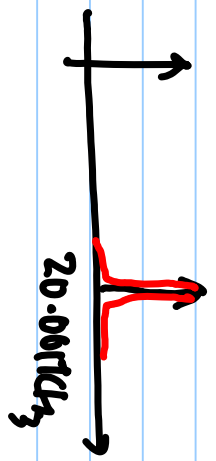
$|D|$ - 20kHz

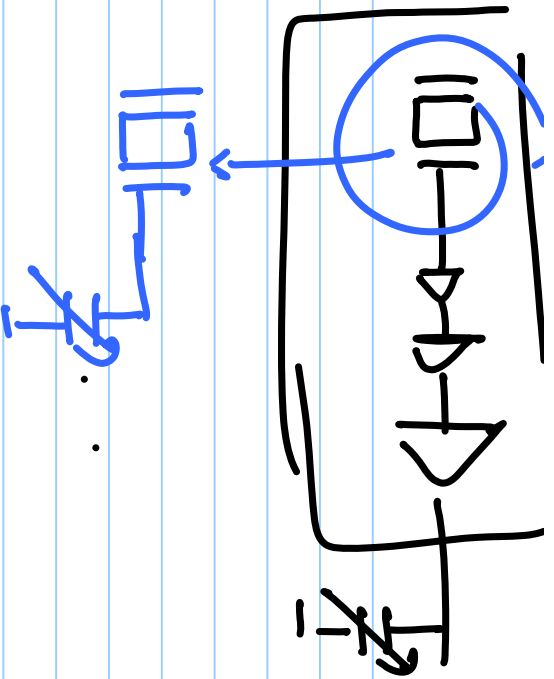
- Low frequency o/p 20.001kHz

- frequency is very stable (10-100ppm)

- Excellent: phase noise

- Not easy to integrate.





Tuned Oscillators