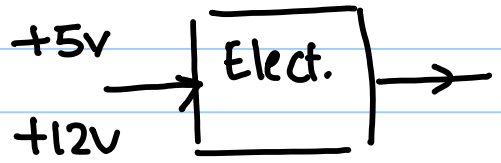
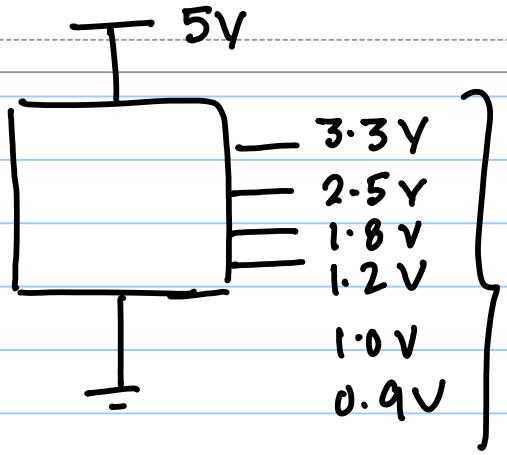
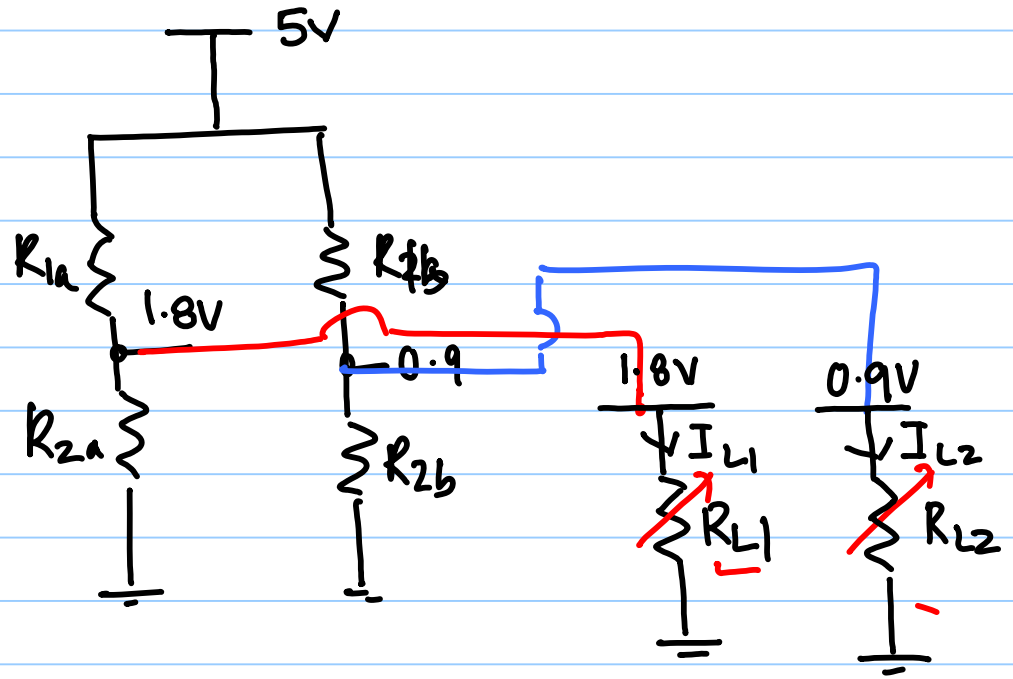
Lecture #22

Note Title 03-03-2022

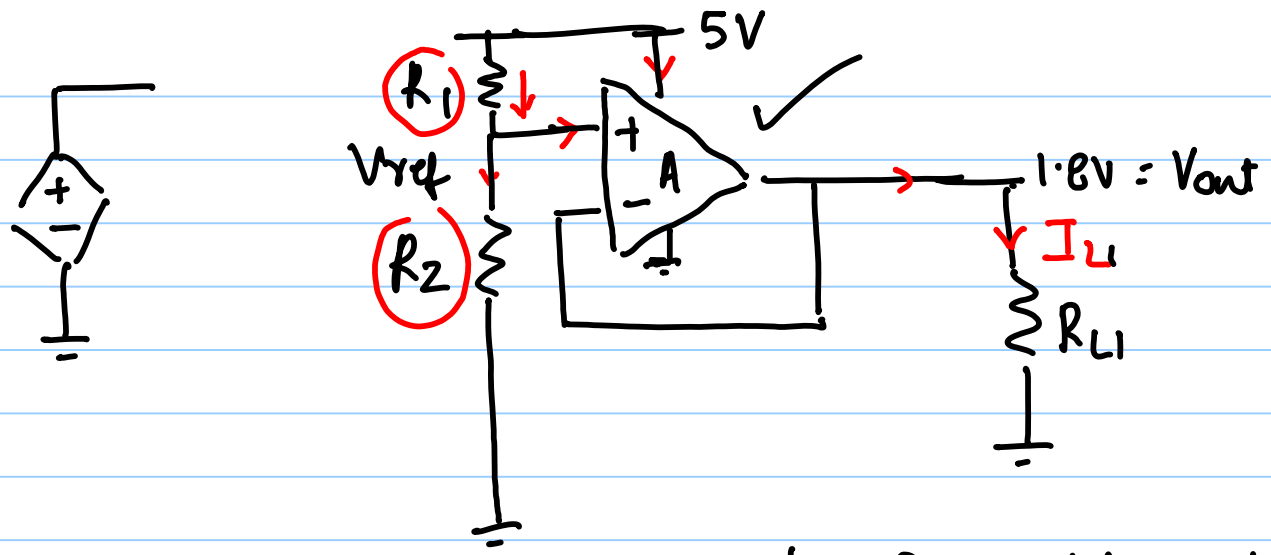


Cell Phone :
- Wireless TX/Rx ✓
- Audio ✓
- Display ✓
- Processor ✓





- $\frac{R_{2a} \| R_{L1}}{R_{1a} + (R_{2a} \| R_{L1})} \times 5V = 1.8V$
- Power dissipation (loss) in R_{1a}, R_{2a}.
- I_{L1}, I_{L2} vary. But, I don't want V_{L1}, V_{L2} to vary.



$$V_{ref} = \frac{R_2}{R_1 + R_2} \cdot 5V = 1.8V$$

$$V_{out} = V_{ref} = 1.8V$$

Power delivered to load = $V_{out} \cdot I_{L1}$

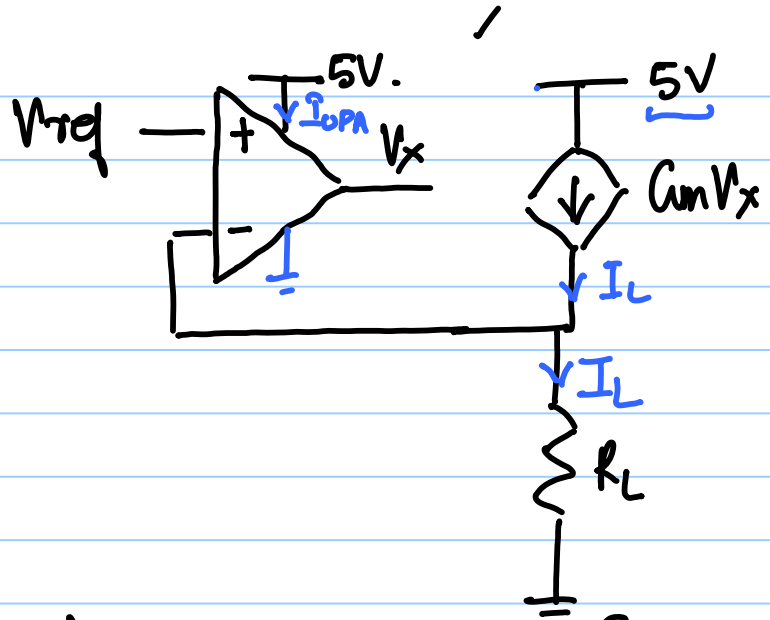
Power dissipated in the circuit
= $5V \times (I_{L1} + I_{OPA})$ + Power in R_1 and R_2

$$\text{Efficiency, } \eta = \frac{V_{out} \cdot I_{L1}}{VDD \times (I_{L1} + I_{OPA})} \times 100$$

Best Case, $I_{OPA} \to 0$

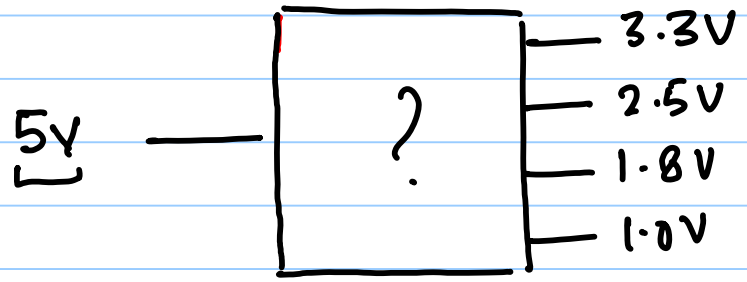
$$\eta = 100 \times \frac{V_{out} \cdot I_{L1}}{VDD \cdot I_{L1}} = \frac{V_{out}}{VDD} \times 100$$

$$\eta = \frac{1.8}{5.0} \times 100$$

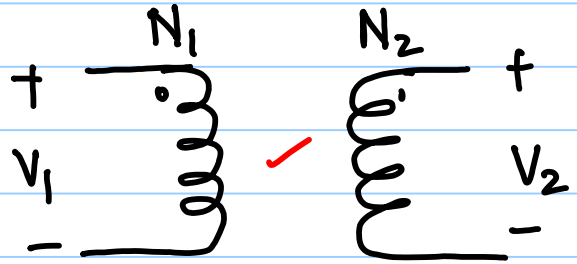


VCCS: Using MOSFETs or BJTs

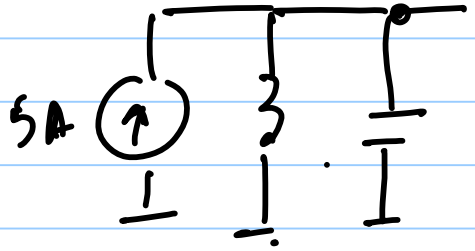
- In previous case, $I_{OPA} > I_L$
- In current case, $I_{OPA} \ll I_L$

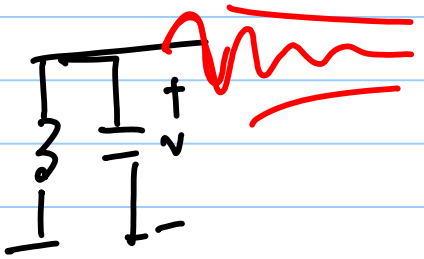


lossless
- Inductor
- Capacitor
- Transformer

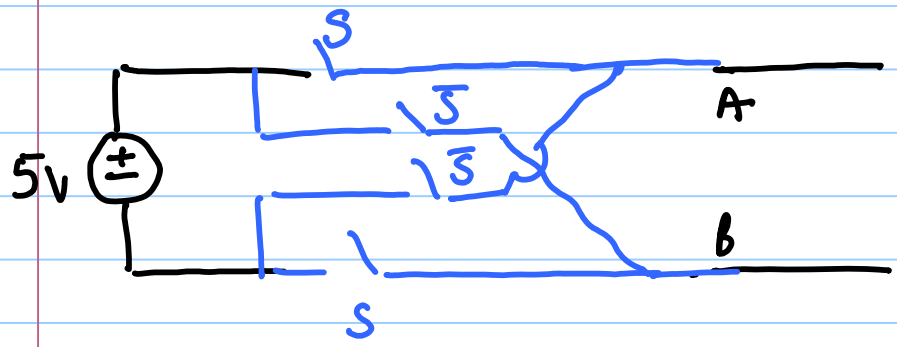


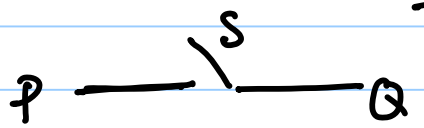
$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$





DC ⟶ AC – AC ⟶ DC



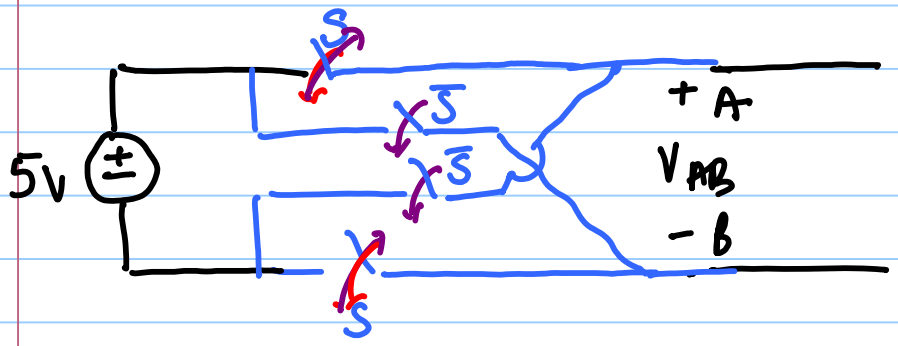


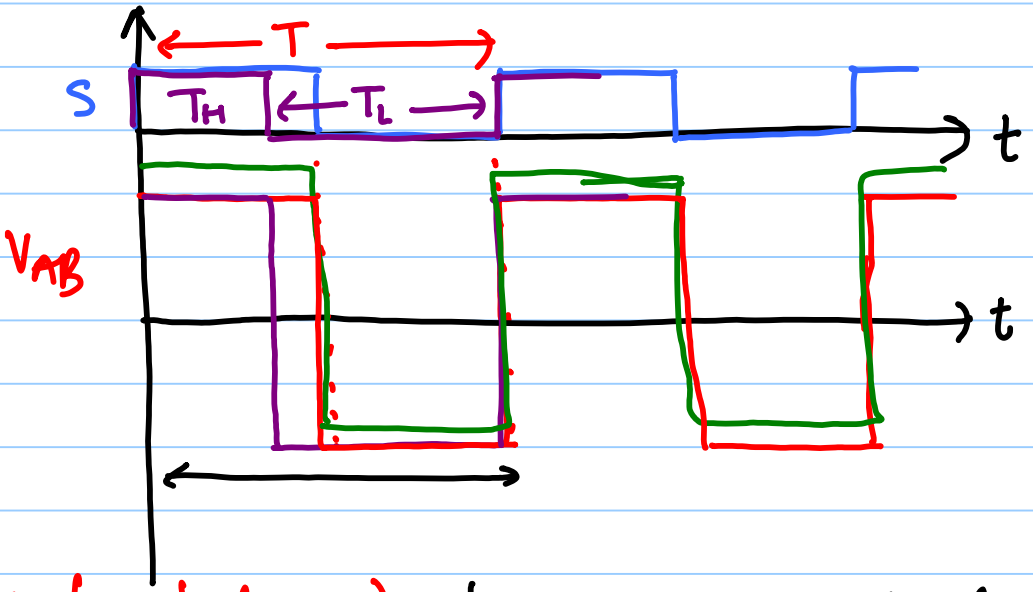
S is high: 

P and Q are shorted

S is low: 

P and Q are not connected.

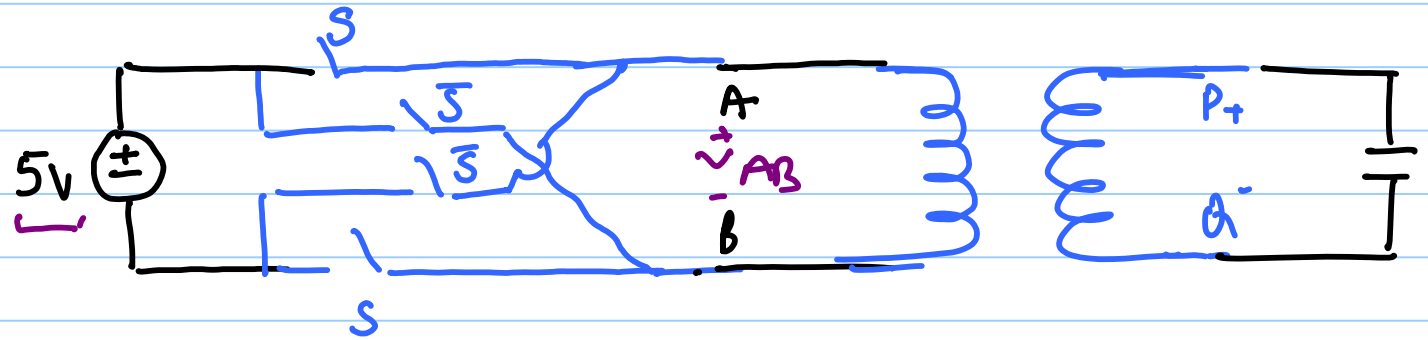




S is 0, $\bar{S}$ is 1

$$V_{AB} = a_0 + \sum a_n \cos(n\omega_0 t) + b_n \sin(n\omega_0 t)$$

$$\omega_0 = \frac{2\pi}{T}$$



DC component of V_{AB}

$$= \frac{5V.(T_H) - 5T_L}{T_H + T_L}$$

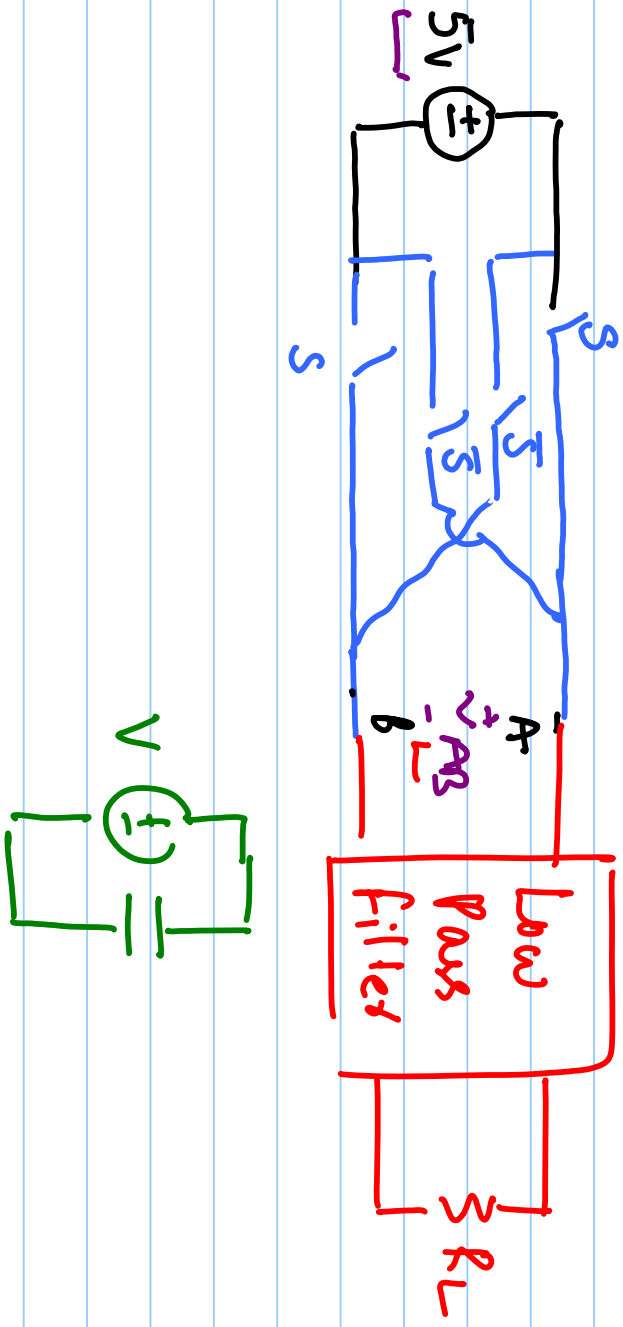
$$= 5V\left(\frac{T_H - T_L}{T}\right)$$

$$= 5V\left(\frac{T_H - (T - T_H)}{T}\right)$$

$$= 5V\left(2.\frac{T_H}{T_L} - 1\right)$$

$$= 5V\,(2.D - 1)$$

D is duty-cylce.


5V
S
S
S
S
A
B
Low Pass Filter
R_L