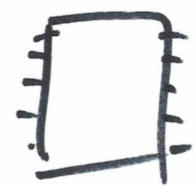
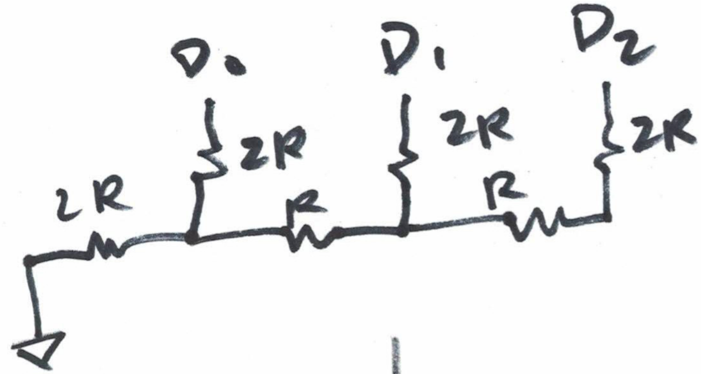
DAC — Digital to Analog Converter

R-2R DAC





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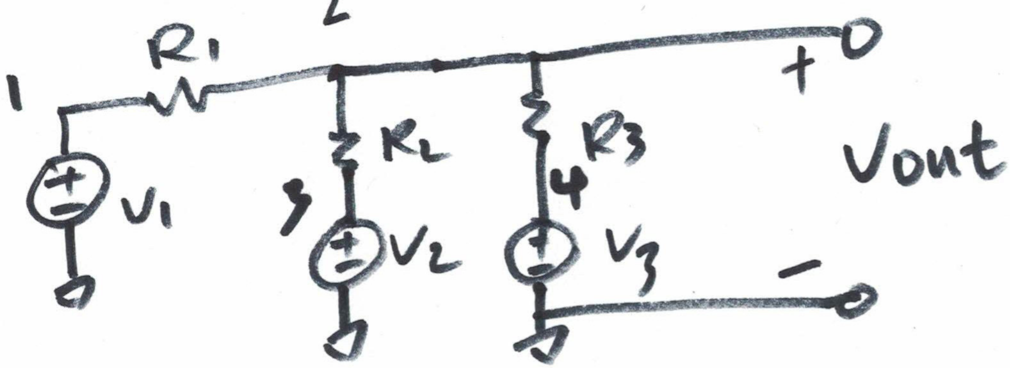
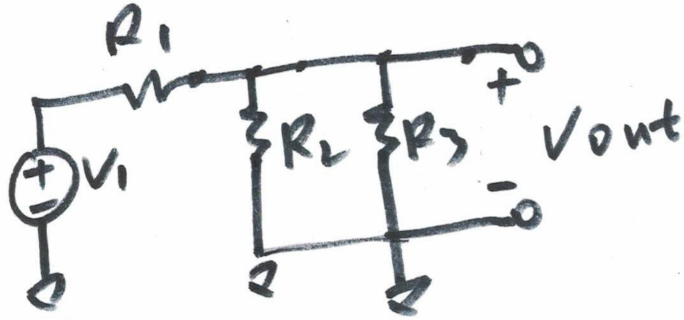
Superposition + Thevenin's Thereom

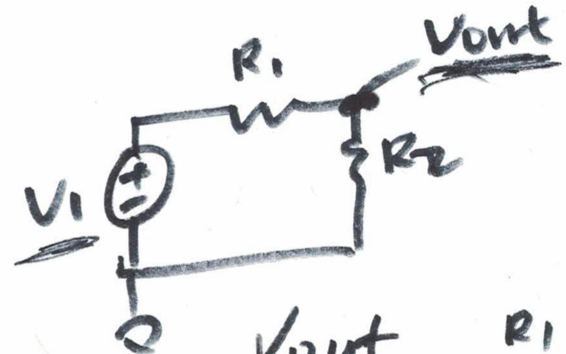
Superposition:



V1 only

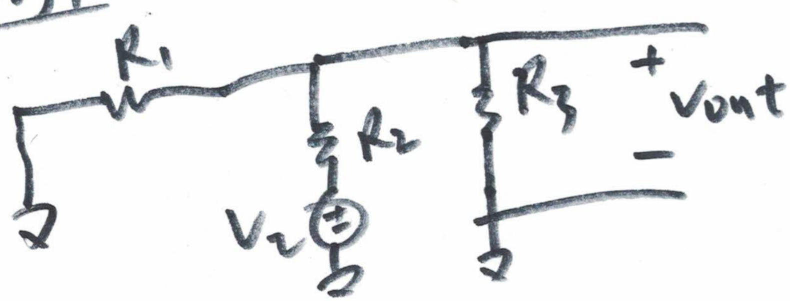


$$\frac{V_{out_1}}{V_1} = \frac{R_2 \| R_3}{R_1 + (R_2 \| R_3)}$$



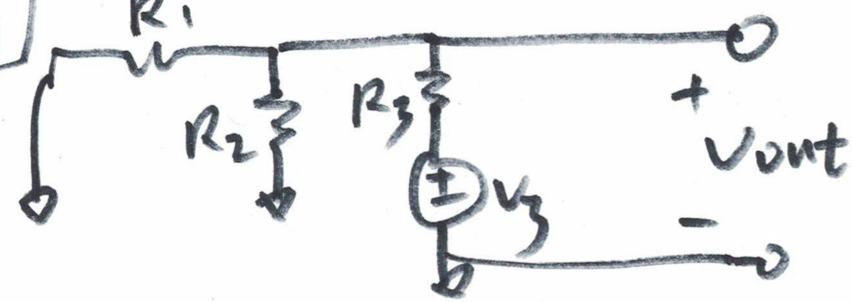
$$\frac{V_{out}}{V_1} = \frac{R_1}{R_1 + R_2}$$

V2 only



$$\frac{V_{out_2}}{V_2} = \frac{R_1 \| R_3}{R_2 + (R_1 \| R_3)}$$

V3 only



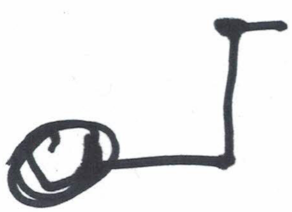
$$\frac{V_{out_3}}{V_{V_3}} = \frac{R_1 \parallel R_2}{R_3 + (R_1 \parallel R_2)}$$

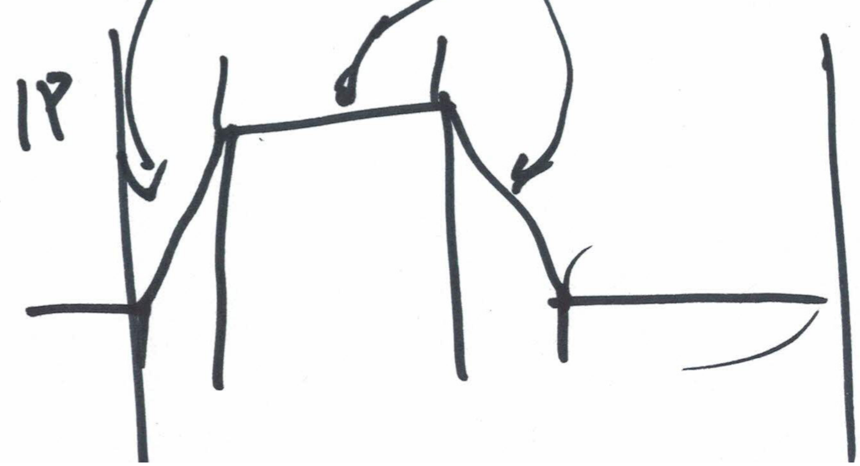
$$V_{out} = V_{out_1} + V_{out_2} + V_{out_3} = \frac{R_2 \parallel R_3}{R_1 + (R_2 \parallel R_3)} + \frac{R_1 \parallel R_3}{R_2 + (R_1 \parallel R_3)} + \frac{R_1 \parallel R_2}{R_3 + (R_1 \parallel R_2)}$$

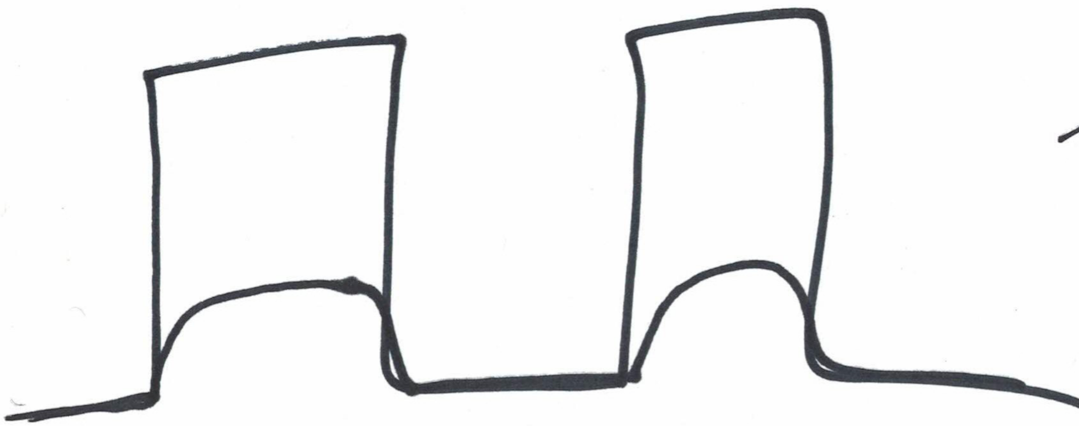
△ Example: $R_1 = 2K$, $R_2 = 4K$, $R_3 = 6K$, $V_1 = 2V$, $V_2 = 4V$, $V_3 = 6V$

$V_{out} = 3.27V$

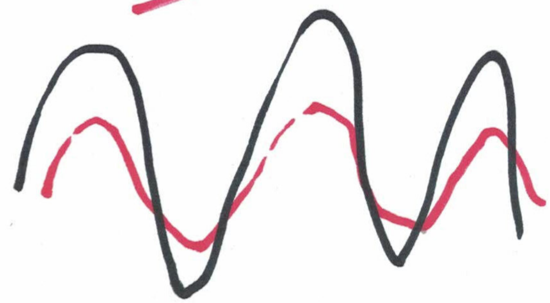
PULSE(Low High Delay Rising Falling OnTime P)

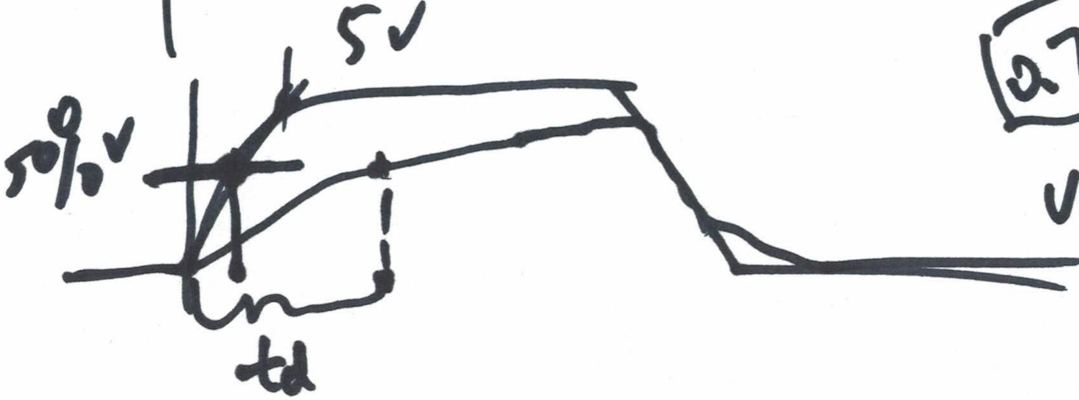


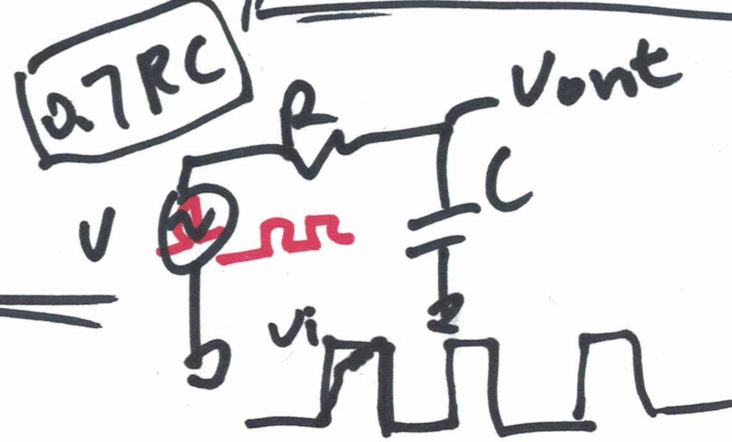


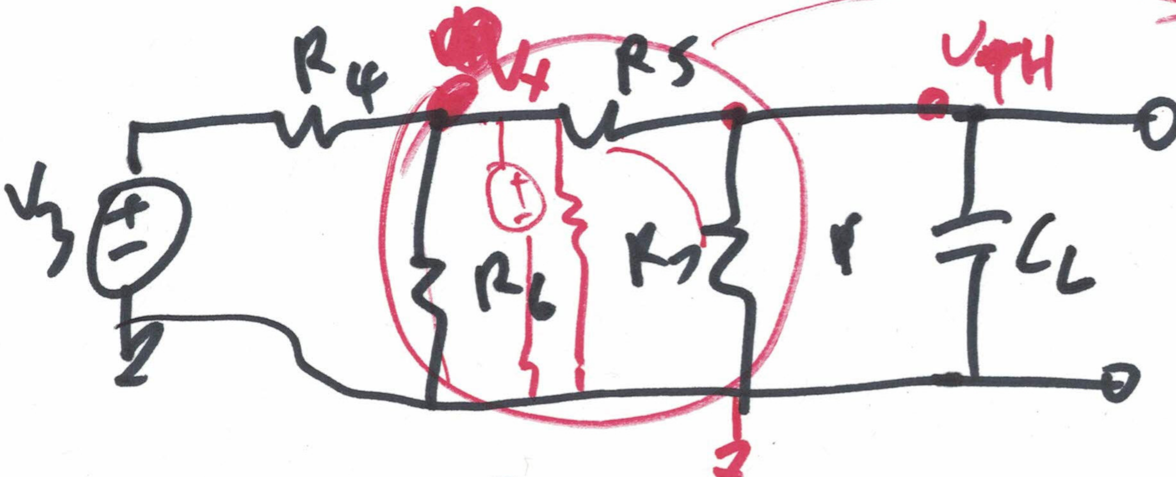


0.7RC

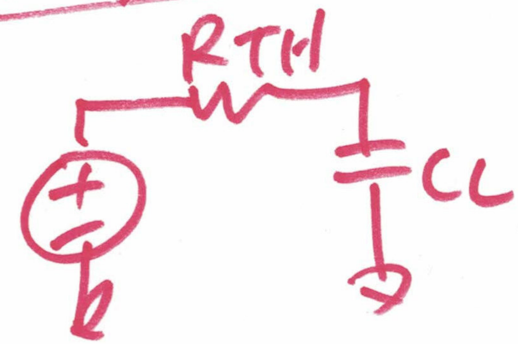








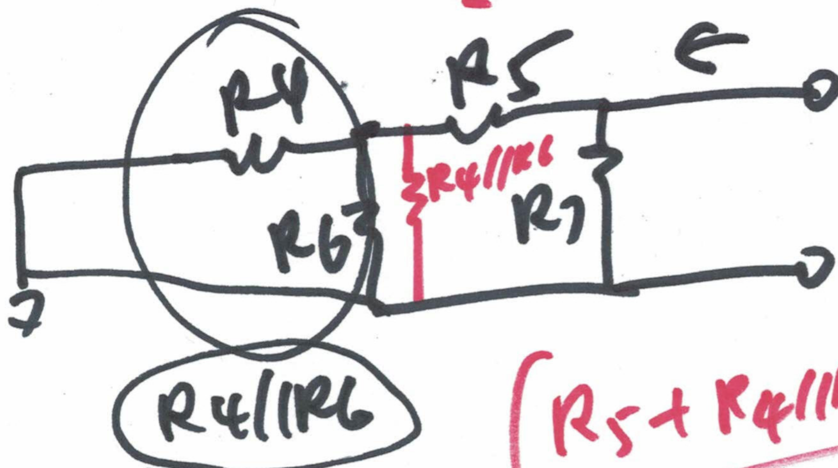
$(R_5 + R_7) \parallel R_6$



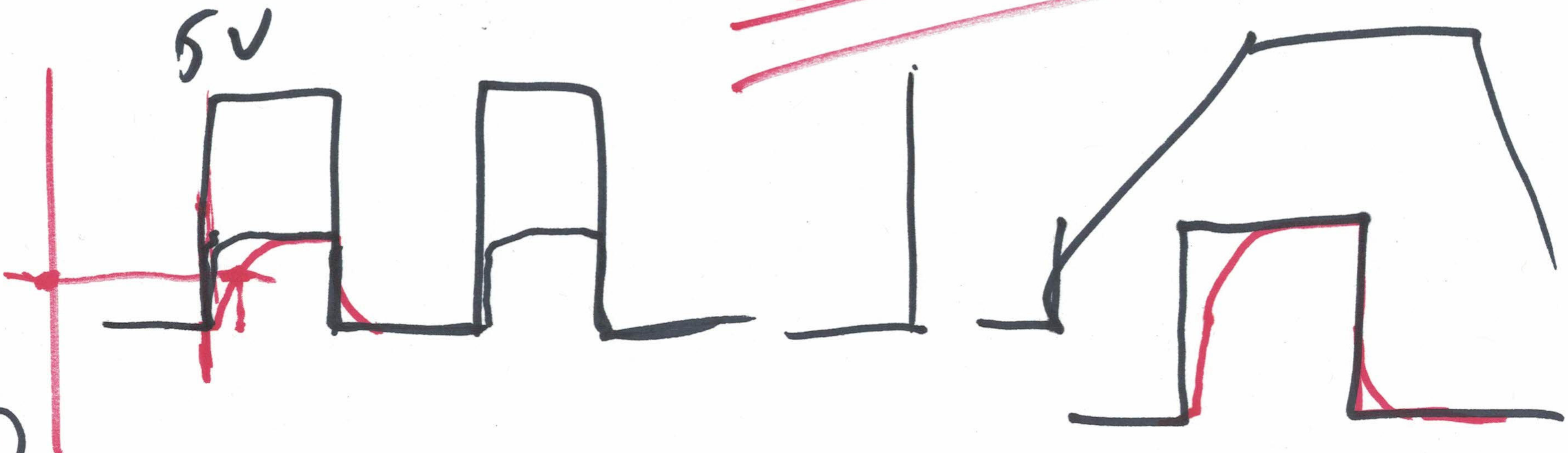
$0.7\,R_{TH}\,C_L$

$V_{TH}/2$

RTH:



$(R_5 + R_4 \parallel R_6) \parallel R_7 = R_{TH}$



$$V_x \; \not{V}_{TH} = \frac{(R_5+R_7) \parallel R_6}{R_4 + \left((R_5+R_7) \parallel R_6\right)}$$

$$V_{TH} = V_x \cdot \frac{R_7}{R_5+R_7}$$