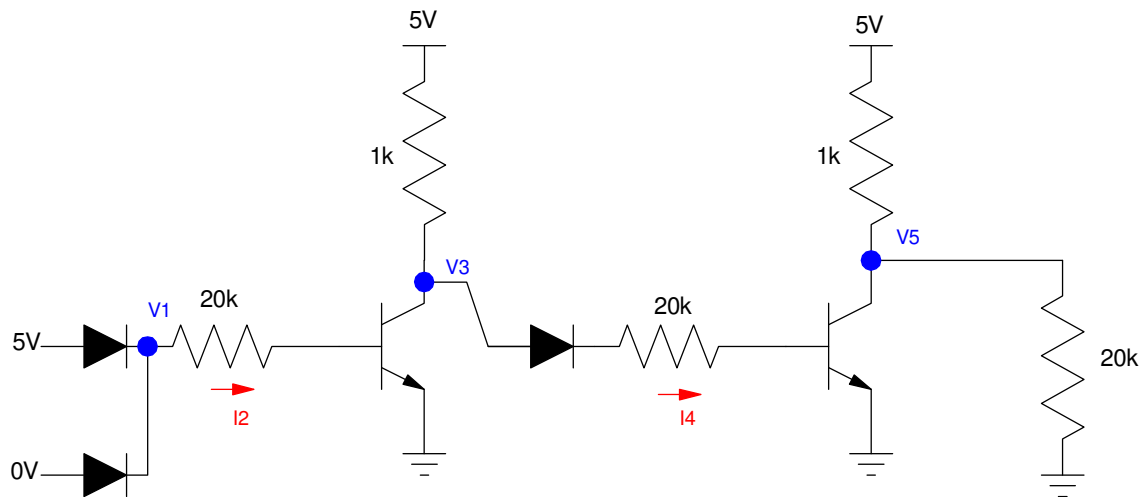


ECE 320: Handout #20

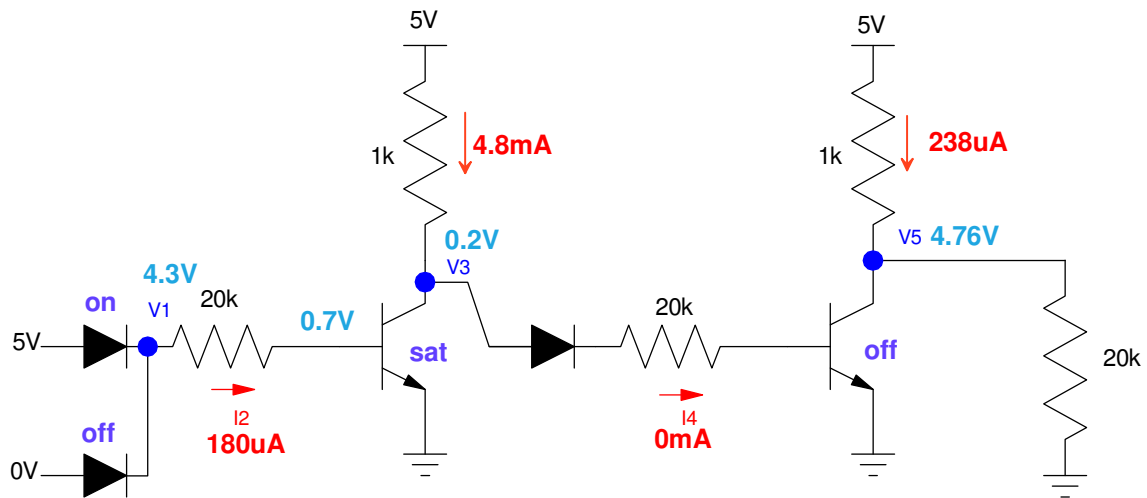
DTL Logic

Determine the voltages and currents. Assume 3904 transistors

- $V_{be} = 0.7V$
- $V_{ce(sat)} = 0.2V$
- $\beta = 100$



Solution



$$I_2 = \left(\frac{5V - 0.7V - 0.7V}{20k} \right) = 180\mu A$$

This allows 18mA to flow through the first transistors

$$\beta I_2 = 18.0mA$$

The maximum current possible is 4.8mA, meaning the first transistor is saturated

$$\max(I_c) = \left(\frac{5V - 0.2V}{1k} \right) = 4.8mA$$

$$18mA > 4.8mA$$

$$\beta I_b > I_c \quad \text{satuated}$$

0.2V isn't enough to turn on the second transistor (it needs at least 1.4V to turn on), so the second transistor is off

$$V_5 = \left(\frac{20k}{20k+1k} \right) 5V = 4.76V$$