

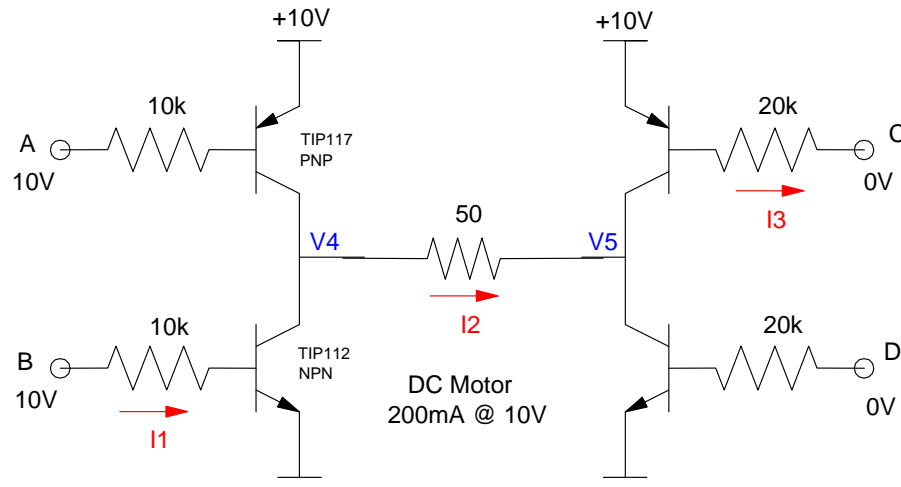
ECE 320 - Homework #5

H-Bridges, DC-to-DC Converters, Fourier Transform. Due Monday, October 7th

H-Bridges

1) Determine the voltages and currents for the following H-bridge. Assume TIP transistors

- $|V_{be}| = 1.4V$
- $\beta = 1000$
- $V_{ce(sat)} = 0.9V$



2) Design an H-Bridge cable of running a DC servo motor forward (+10V), reverse (-10V) and stop (0V). Assume the DC servo motor draws 200mA @ 10V.

3) Check your design for problem #2 in PartSim (or similar program)

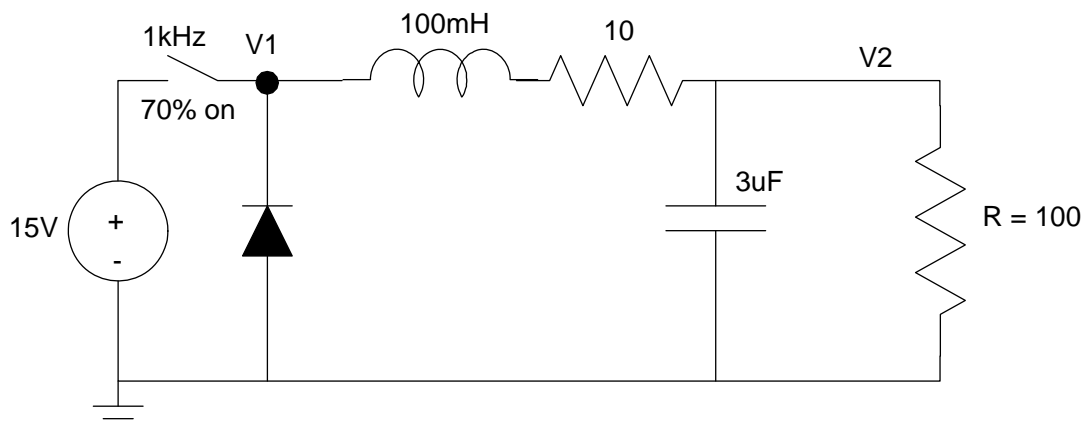
4) **Lab:** Build your circuit in lab and verify it works for all three states (forward, reverse, stop).

- note: Check V_{ce} . If it's 0.9V, the transistor is saturated (on)

DC to DC (Buck) Converters

5) For the following DC to DC converter, determine the voltage at V1 and V2 (both DC and AC).

6) Check your analysis in PartSim (or similar program)



7) Design a Buck converter to convert +15VDC to +5VDC, capable of driving 100mA

Fourier Transform

8) Find the first 5-terms of the Fourier Series for V1 in problem #5

$$V_1 = \begin{cases} +15V & 70\% \text{ of the time} \\ -0.7V & 30\% \text{ of the time} \end{cases}$$

9) Determine V2 for problem #5 for the Fourier series approximation of V1 from problem #8