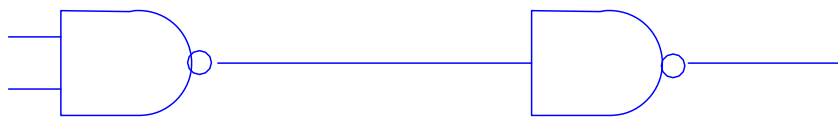
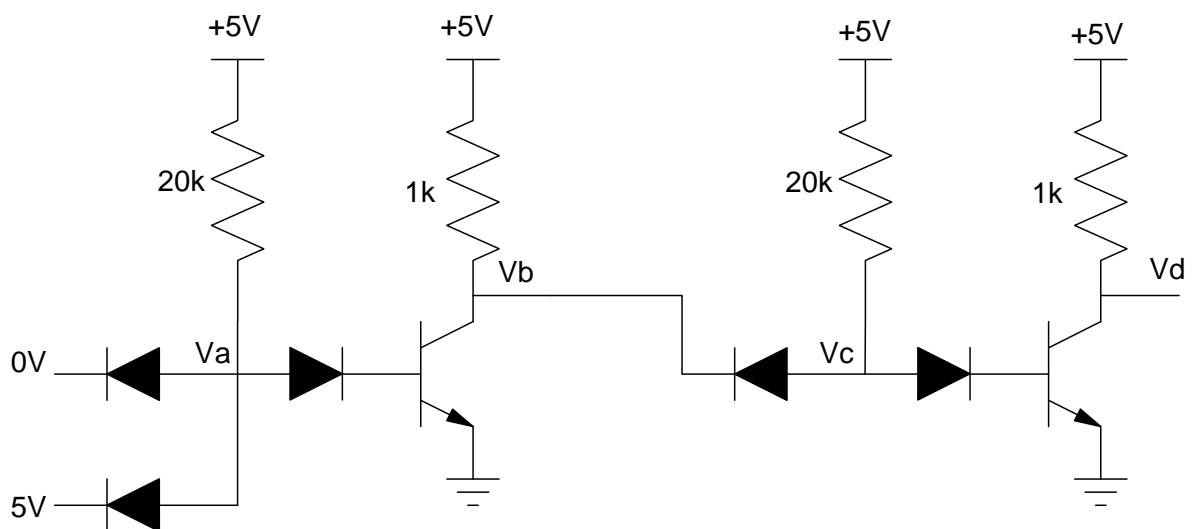


ECE 320 - Quiz 6: Name _____

March 5, 2015 - SCR, DTL Logic

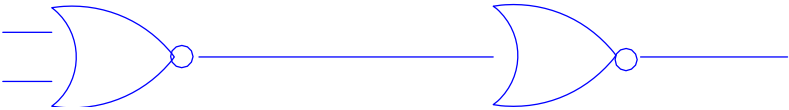
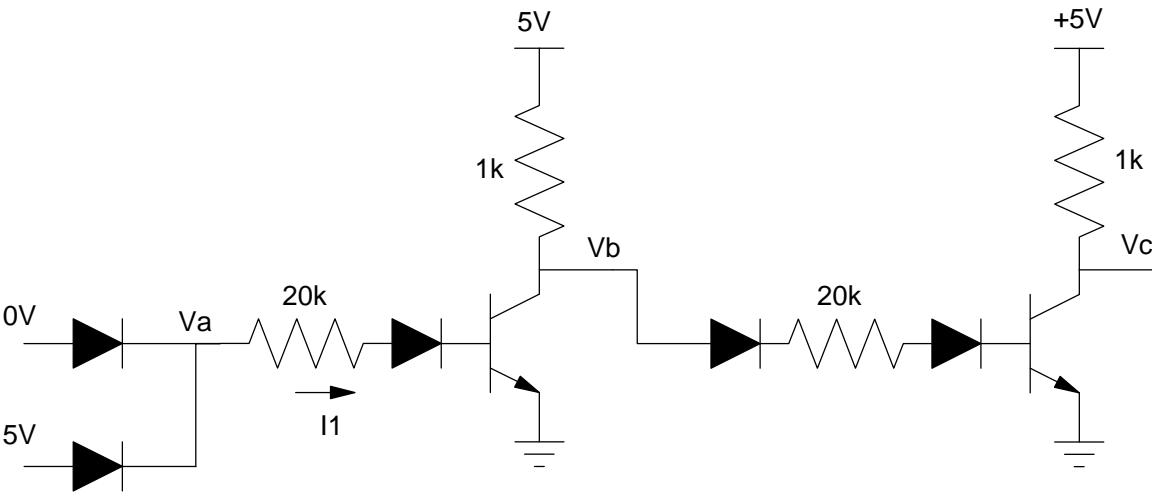
1) DTL Logic (NAND gates): Determine the voltages for the following DTL circuit. Assume $\beta = 100$

Va	Vb	Vc	Vd



2) DTL Logic (NOR gates): Determine the voltages for the following DTL circuit. Assume $\beta = 100$

I1	Va	Vb	Vc



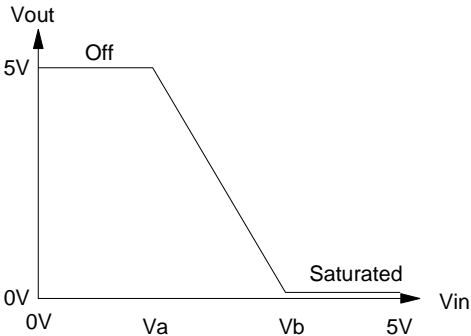
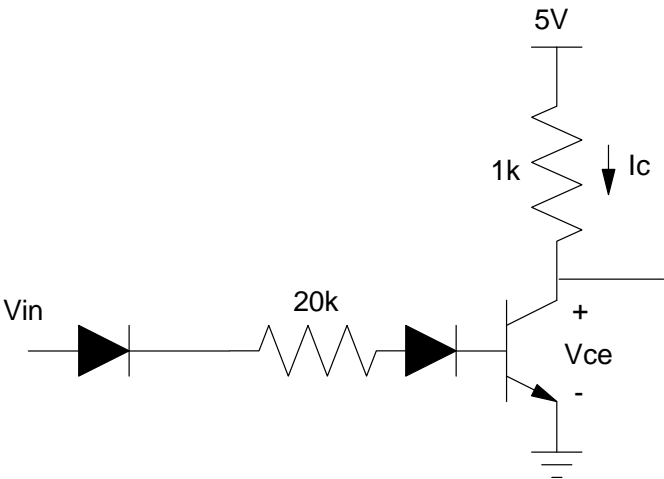
3) The circuit shown below is a DTL inverter based upon a NOR gate. The relationship between the input and output voltages are as shown below.

Determine V_a and V_b :

V_a : The maximum voltage for V_{in} where the transistor is off (input = logic level 0)

V_b : The minimum voltage for V_{in} where the transistor is saturated (input = logic level 1)

V_a The maximum voltage for V_{in} where the transistor is off (input = logic level 0)	V_b The minimum voltage for V_{in} where the transistor is saturated (input = logic level 1)

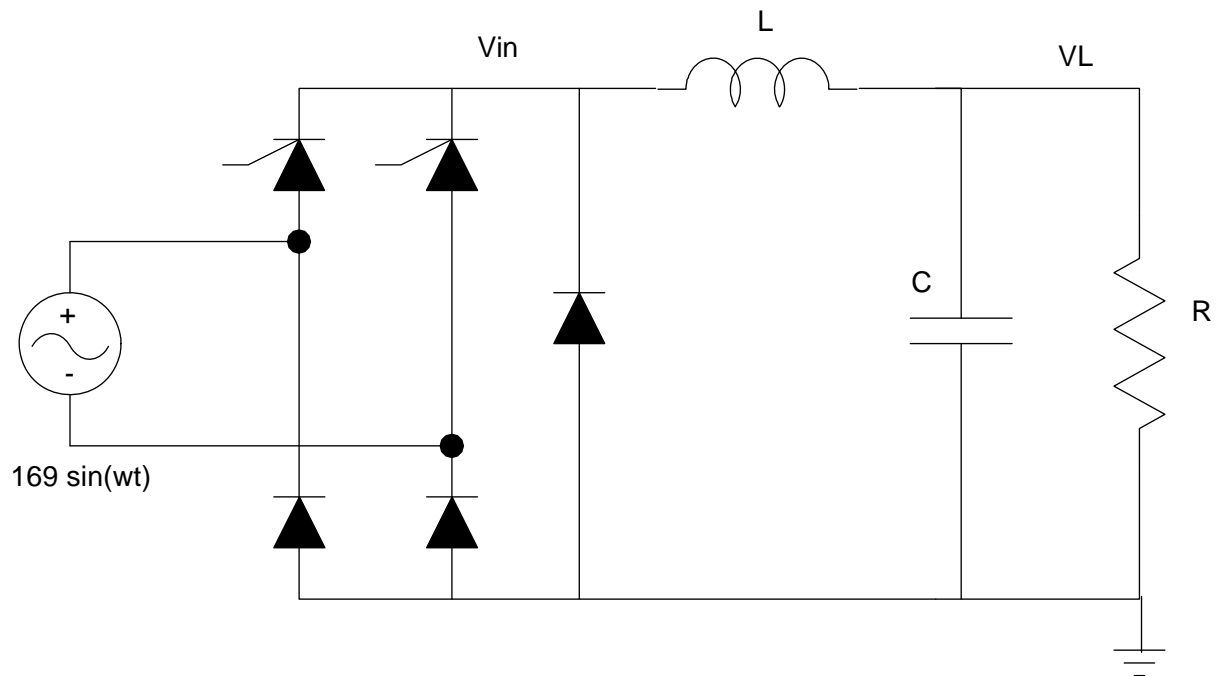


4) SCR: The mean (DC) voltage vs. firing angle for the following circuit is

$$100V = \frac{1}{\pi} \int_{\theta}^{\pi} 169 \sin(t) dt$$

Determine the firing angle so that the mean voltage is 100V

Firing Angle (θ)	Resulting peak-to-peak voltage at V_{in}



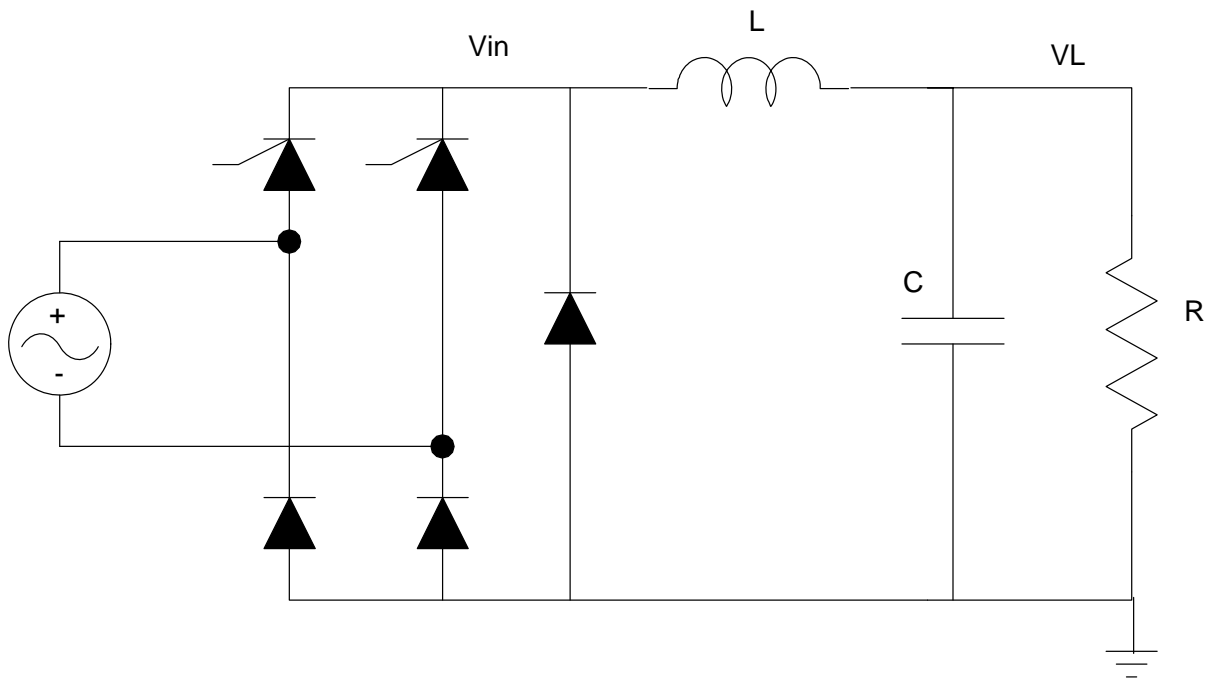
5) SCR: Assume An SCR is firing so that

- The mean voltage of V_{in} is 20V, and
- V_{in} has a peak-to-peak voltage of 80V

$$V_{in} \approx 20 + 40 \sin(240\pi t)$$

Find R, L and C so that the load draws 1A and has a peak-to-peak ripple of 1V.

R (1A at load)	L	C



Bonus: According to the U.S. Energy Information Administration, the average household in North Dakota consumes 1205kWh each month. The average energy density of sunlight in North Dakota over the year is 4kWh/m² (same source). How much area of your roof needs to be covered with solar panels at 30% efficiency to make each house energy neutral on average?