

ECE 320 - Homework #7

DC to AC, SCR, Boolean Logic. Due Monday, October 12th

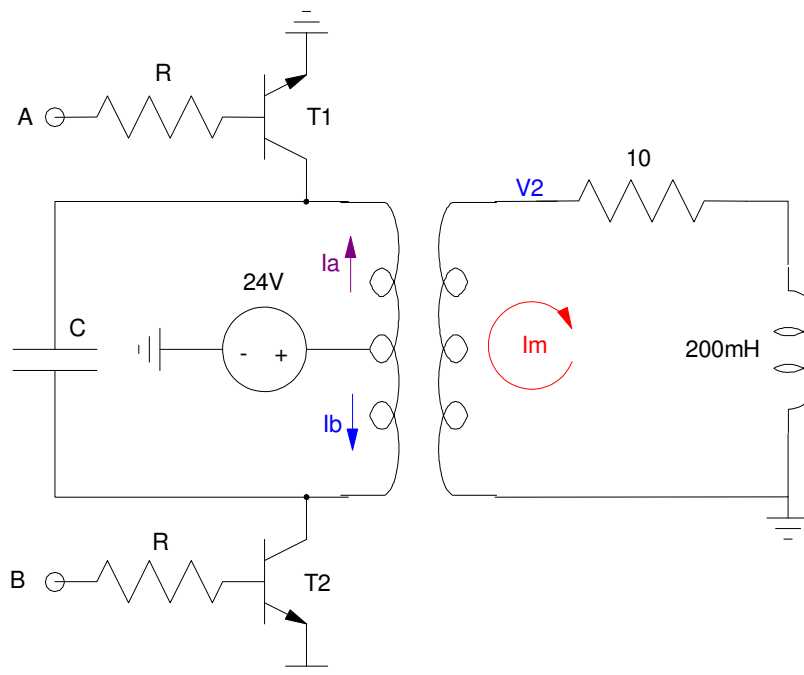
DC to AC

1) Let

- $A = 0V / 5V$ square wave, 60Hz, 0 degree time delay
- $B = 0V / 5V$ square wave, 60Hz, 180 degree time delay
- $C = 10\mu F$

Determine using CircuitLab the voltage V_2 (i.e. the voltage across a DC motor, modeled as a 10 Ohm & 200mH load)

2) Adjust C so that the voltage across the motor is as close to a sine wave as possible (trial and error)



DC to AC Converter (problem 1 - 2)

SCR

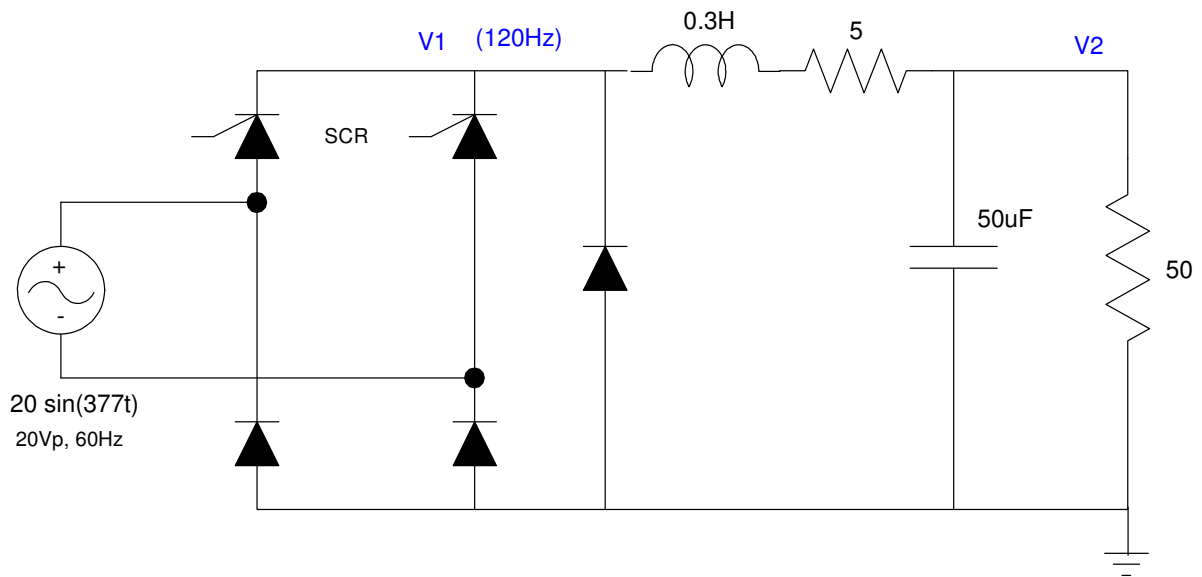
3) Assume a firing angle of 25 degrees. Determine the voltage at V_1 and V_2 (both DC and AC).

4) Change this circuit so that

- The voltage at V_2 is 5.00V (DC)
- With a ripple of 500mVpp

5) Simulate this circuit in Matlab by

- Writing the differential equations which describe this circuit (state variables: I_L and V_C)
- Specify $V_1(t)$ as a full-wave rectified sine wave, clipped at X degrees (from problem #4)
- Use numerical integration to find $V_2(t)$



SCR: Problem 3 - 5

Boolean Logic:

5) Implement the following function using NAND gates (i.e. circle the ones)

f(A,B,C,D)		CD			
		00	01	11	10
AB	00	1	0	0	0
	01	1	1	0	1
	11	x	x	x	x
	10	1	1	x	x

6) Implement the following function using NOR gates (i.e. circle the zeros)

f(A,B,C,D)		CD			
		00	01	11	10
AB	00	1	0	0	0
	01	1	1	0	1
	11	x	x	x	x
	10	1	1	x	x