ECE 320 - Quiz #7 - Name _____

DC to AC, SCR, Boolean Logic

DC to AC Converter

1) Assume the Fourier transform for the output of a DC to AC converter driving a 1 Ohms reisistor is as follows:
   - note: units are Vp (peak voltage)
   - $Energy = \frac{1}{2}(a_n^2 + b_n^2)$ *Watts: assumes a 1 Ohm resistive load*

Harmonic	0 (DC)	1	2	3	4	5
an (cosine)	0	Birth Month (1..12)	5 Vp	3 Vp	0	0
bn (sine)	0	Birth Date (1..31)	0	0	2 Vp	0

Determine the following:

Total Energy in the signal Watts	Energy in the 1st harmonic Watts	Efficiency % of energy in the 1st harmonic

DC to AC Converter: Differential equations for a Circuit

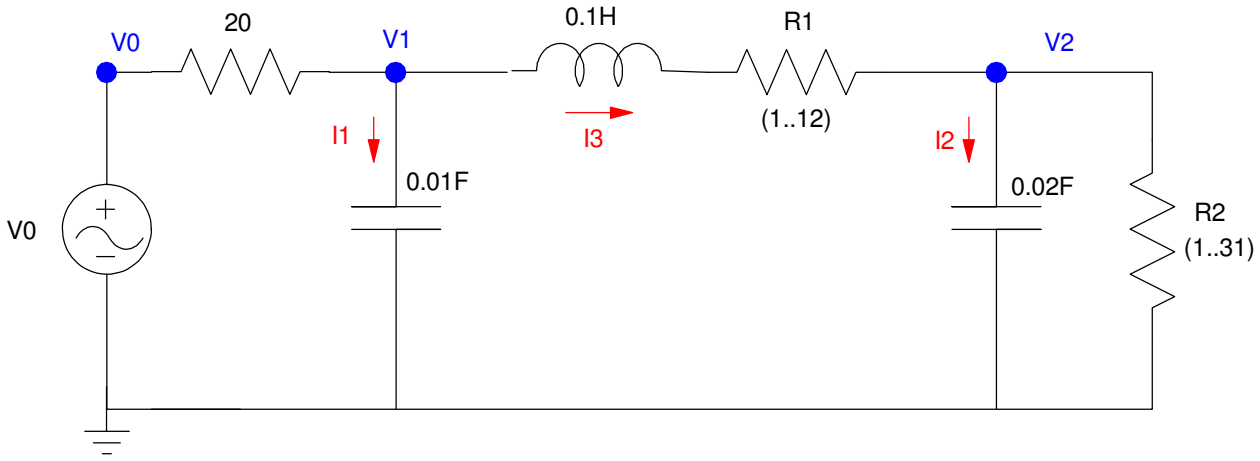
2) Determine the 3 differential equations which describe the following circuit. Assume

- R1 = 1..12 Ohms (your birth month)
- R2 = 1..31 Ohms (your birth date)

Note

- $I = C\frac{dV}{dt}$ *capacitors*
- $V = L\frac{dI}{dt}$ *inductors*

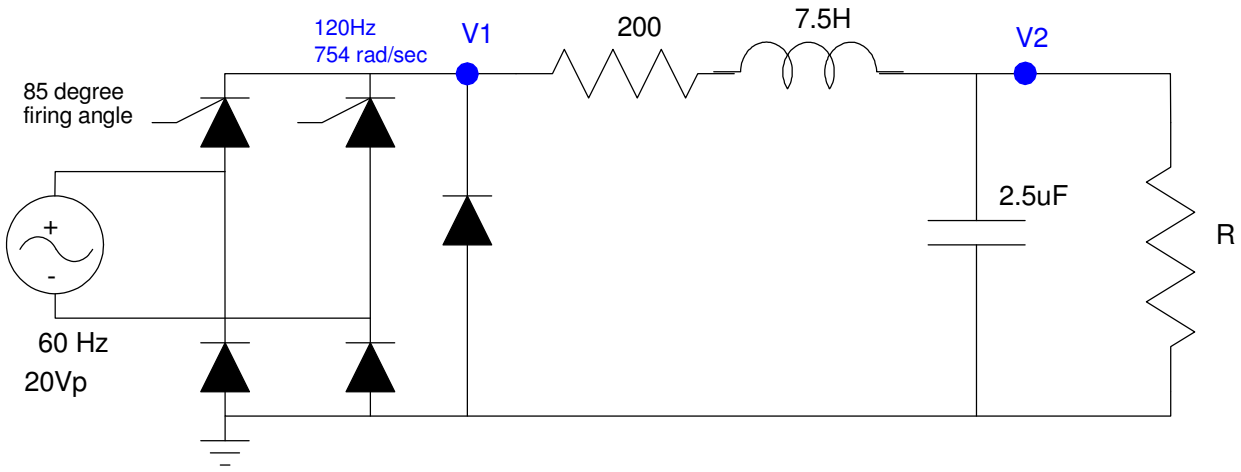
$\frac{dV_1}{dt} = f_1(V_0, V_1, V_2, I_3) = ?$
$\frac{dV_2}{dt} = f_2(V_0, V_1, V_2, I_3) = ?$
$\frac{dI_3}{dt} = f_3(V_0, V_1, V_2, I_3) = ?$



SCR (5 diode version)

3) SCR: Analysis. Determine the votlages at V1 and V2 (both DC). Assume a firing angle of 85 degrees.

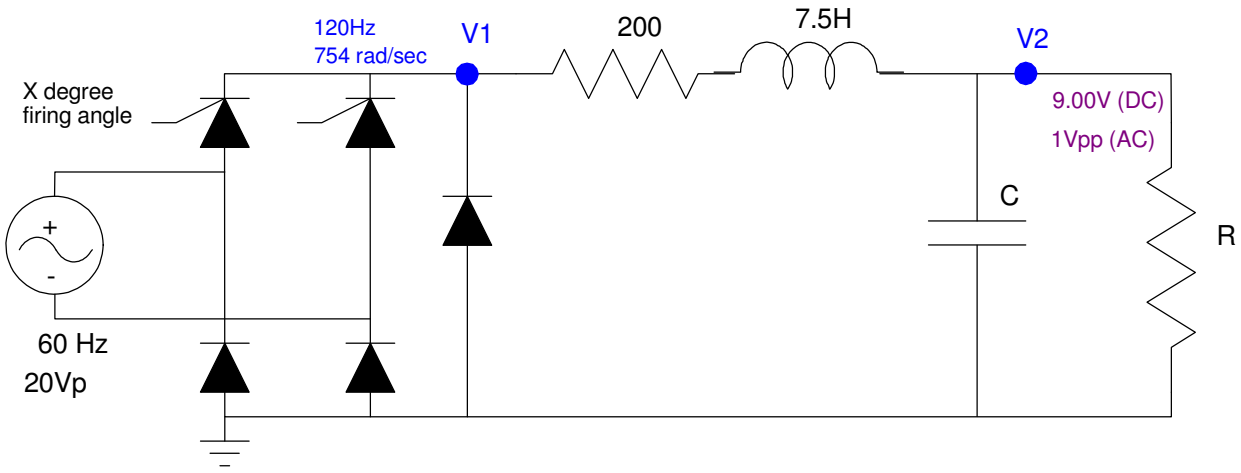
R 1000 + 100*Mo + Day	V1		V2	
	DC	AC (V1pp)	DC	AC (V2pp)



4) SCR Design. Determine the firing angle and C so that

- V2(DC) = 9.00V
- V2(AC) = 1.00Vpp
- R = 1000 + 100*(Birth Month) + (Birth Day). May 14th would give R = 1514 Ohms.

V1(DC)	Firing Angle	C	R 1000 + 100*Mo + Day



5) Design a circuit using NAND gates to implement the following logic

- hint: Circle the ones

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

6) Design a circuit using NOR gates to implement the following logic

- hint: Circle the zeros

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