# ECE 320 - Quiz #7 - Name _____

DC to AC, SCR

## 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) | 0 | 0 | 0 | 0 |
| bn (sine) | 0 | Birth Date (1..31) | 0 | 0 | 0 | 0 |

Determine the following:

| Total Energy in the signal<br>Watts | Energy in the 1st harmonic<br>Watts | Efficiency<br>% of energy in the 1st harmonic |
|---|---|---|
| | | |

## DC to AC Converter

2) 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)
- *Watts: assumes a 1 Ohm resistive load*
- $Energy = \frac{1}{2}(a_n^2 + b_n^2)$

| Harmonic | 0 (DC) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| an (cosine) | 0 | 60Vp | 0 | 10Vp | Birth Date (1..31) | 0 |
| bn (sine) | 0 | 0 | Birth Month (1..12) | 0 | 0 | 5Vp |

Determine the following:

| Total Energy in the signal<br>Watts | Energy in the 1st harmonic<br>Watts | Efficiency<br>% of energy in the 1st harmonic |
|---|---|---|
| | | |

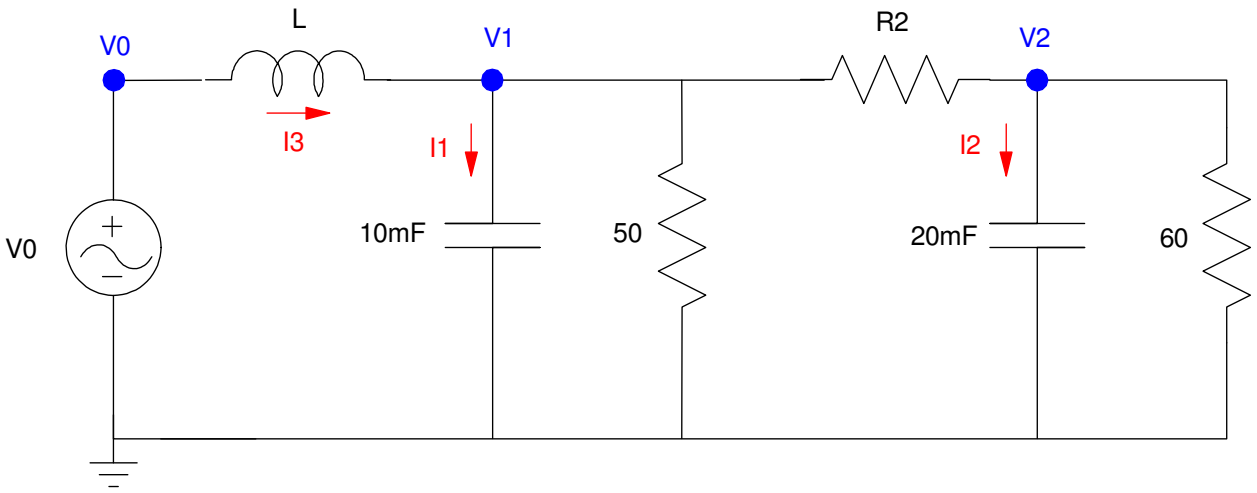
## Circuits & Differential Equations

3) Write the differential equation which describes the following circuit. Assume

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

Note:

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

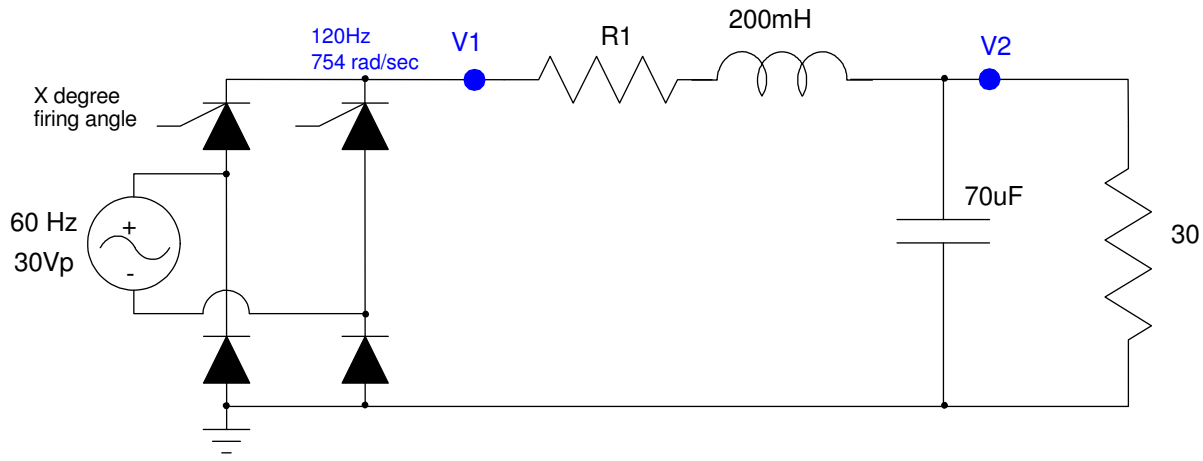


## SCR (4 diode version)

4) SCR: Analysis. Determine the votlages at V1 and V2 (both DC). Assume

- R1 = your birth month (1..12)
- X = 10 + your birth date (11..41 degree firing angle)

| Firing Angle<br>day + 10 | V1 | | V2 | |
|---|---|---|---|---|
| | DC | AC (V1pp) | DC | AC (V2pp) |
| | | | | |

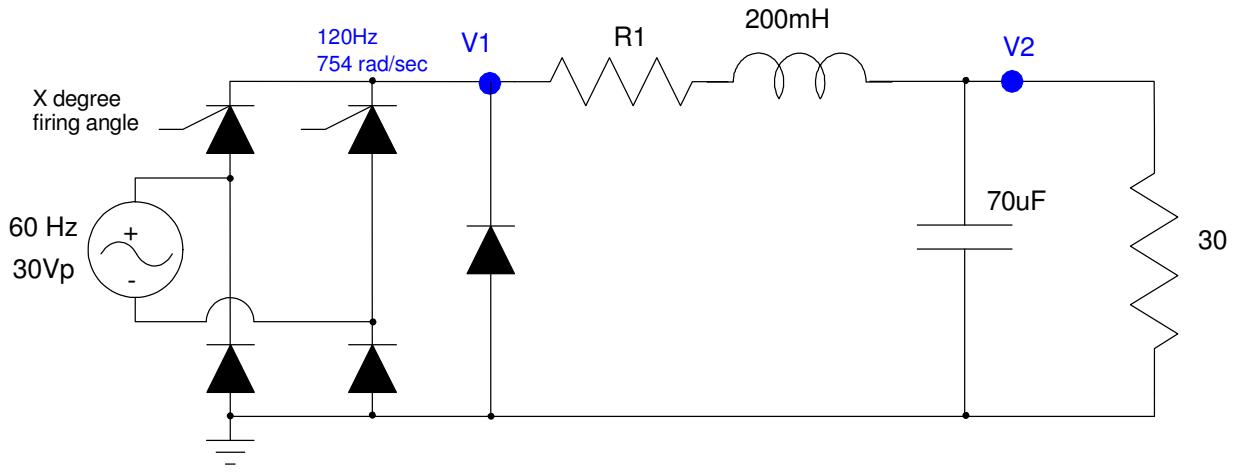


## SCR (5 diode version)

5) SCR: Analysis. Determine the votlages at V1 and V2 (both DC). Assume

- R1 = your birth month (1..12)
- X = 10 + your birth date (11..41 degree firing angle)

| Firing Angle<br>day + 10 | V1 | | V2 | |
|---|---|---|---|---|
| | DC | AC (V1pp) | DC | AC (V2pp) |
| | | | | |



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

- V2(DC) = 10.00V
- V2(AC) = 1.00Vpp
- R1 = Your Birth Month (1..12)

| V1(DC) | Firing Angle | C | R1<br>Month (1..12) |
|---|---|---|---|
| | | | |