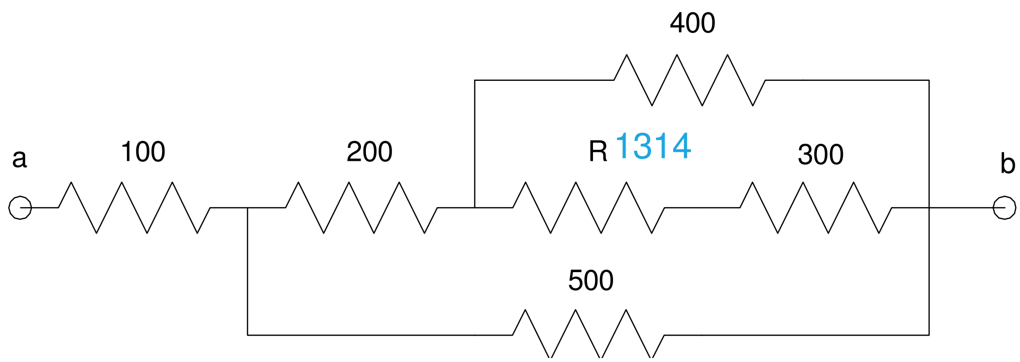
ECE 320 - Quiz #1 - Name ____________________

EE 206 Review. Spring 2023

1) Determine the resistance Rab. Assume

- R = 800 + 100*(your birth month) + (your birth date). For example, May 14th would give R = 1314

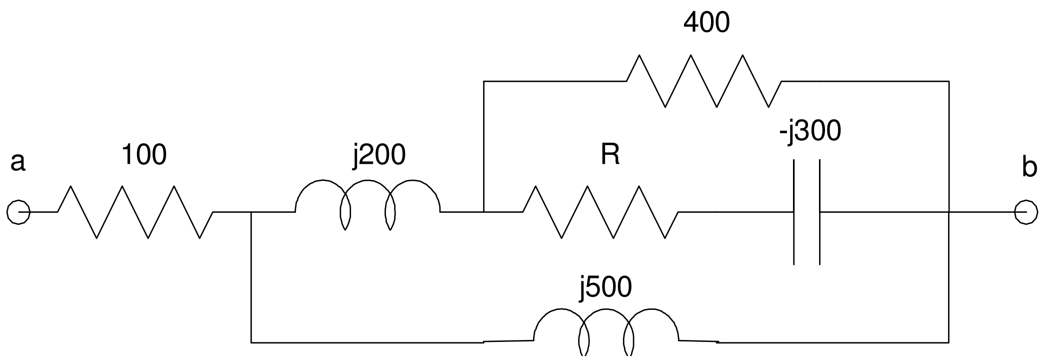
R 800 + 100*mo + day	Rab
1314 Ohms	**355.03**



2) Determine the impedance Zab. Assume

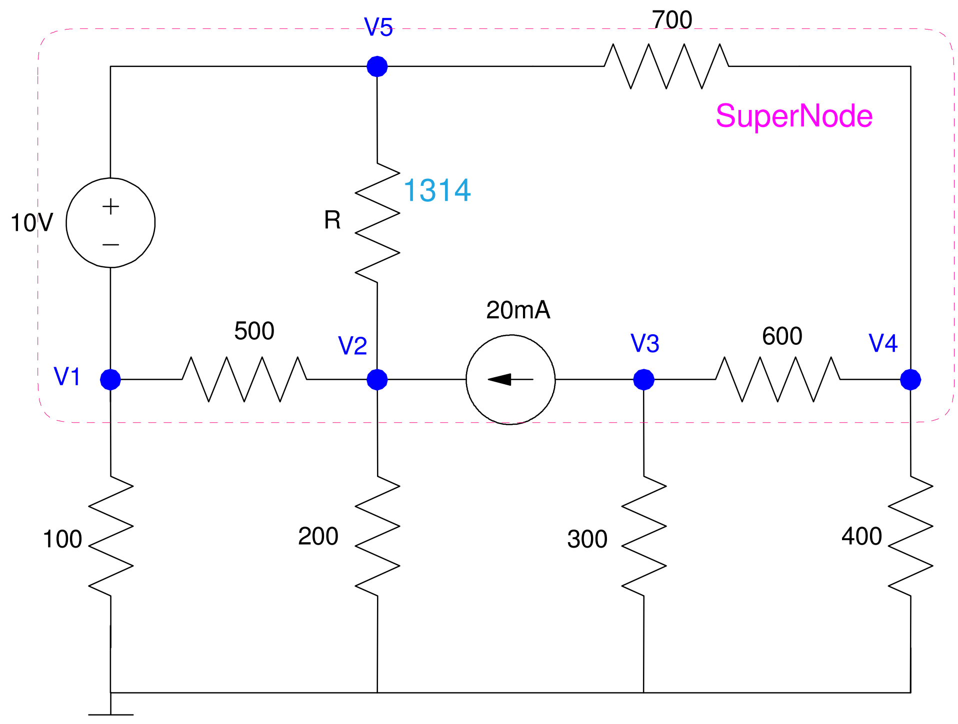
- R = 800 + 100*(your birth month) + (your birth date). For example, May 14th would give R = 1314

R 800 + 100*mo + day	Zab
1314	**237.2 + j196.6**



3) Give N voltage node equations to solve for the N unknown voltages. Assume

- R = 800 + 100*(your birth month) + (your birth date). For example, May 14th would give R = 1314



Start with the easy ones

$$V_5 - V_1 = 10$$

Node Equations

$$\left(\frac{V_2-V_1}{500}\right) + \left(\frac{V_2-V_5}{1314}\right) + \left(\frac{V_2}{200}\right) - 20mA = 0$$

$$20mA + \left(\frac{V_3}{300}\right) + \left(\frac{V_3-V_4}{600}\right) = 0$$

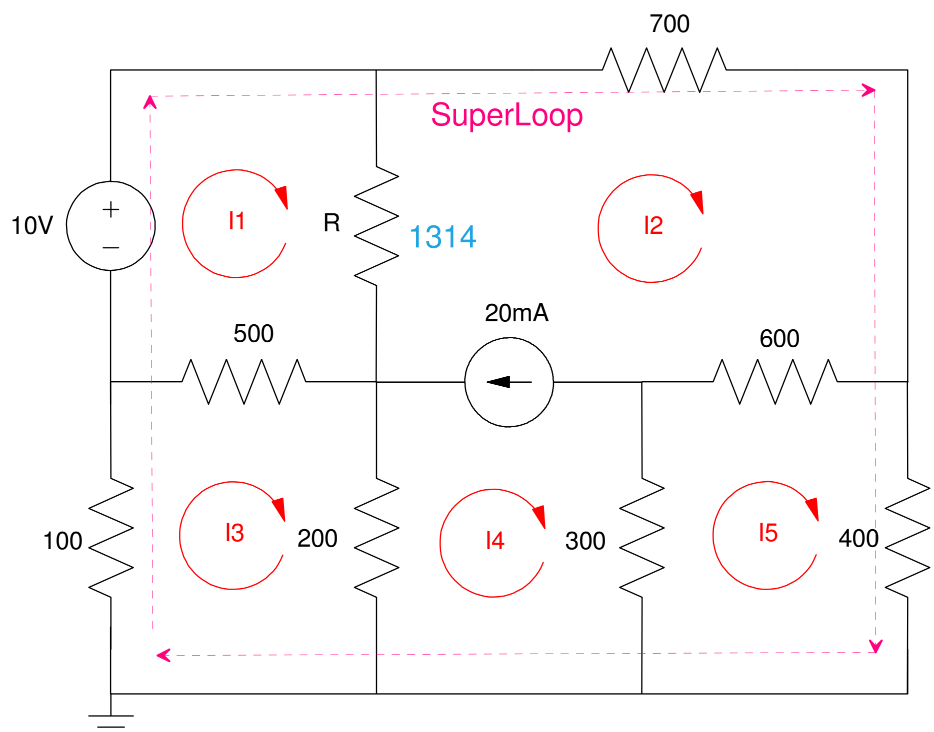
$$\left(\frac{V_4-V_2}{700}\right) + \left(\frac{V_4-V_3}{600}\right) + \left(\frac{V_4}{400}\right) = 0$$

Supernode

$$\left(\frac{V_1}{100}\right) + \left(\frac{V_2}{200}\right) + \left(\frac{V_3}{300}\right) + \left(\frac{V_4}{400}\right) = 0$$

4) Give N current loop equations to solve for the N unknown currents. Assume

- R = 800 + 100*(your birth month) + (your birth date). For example, May 14th would give R = 1314



Start with the currrent source

$$I_2 - I_4 = 20mA$$

Write the loop equations

$$-10 + 1314(I_1 - I_2) + 500(I_1 - I_3) = 0$$

$$100I_3 + 500(I_3 - I_1) + 200(I_3 - I_4) = 0$$

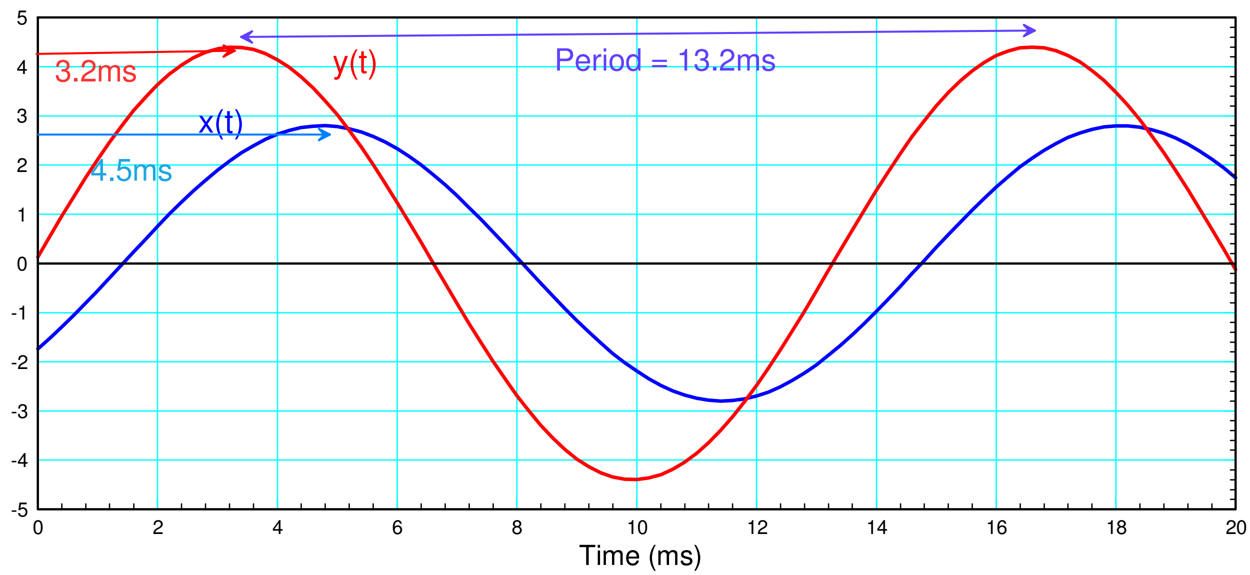
$$300(I_5 - I_4) + 600(I_5 - I_2) + 400I_5 = 0$$

Superloop

$$100I_3 - 10 + 700I_2 + 400I_5 = 0$$

5) Signals X and Y are displayed on an oscilloscope. Give the phasor representation for these two voltages

Frequency (Hz)	X		Y	
	Amplitude	Phase	Amplitude	Phase
75.7 Hz	**2.8V**	**-122 deg**	**4.4V**	**-87 deg**



1 cycle = 13.2ms

$$f = \frac{1}{period} = \frac{1}{13.2ms} = 75.7Hz$$

Phase for X

$$\theta_x = -\left(\frac{\text{4.5ms delay to peak}}{\text{13.2ms period}}\right)360^0 = -122^0$$

Phase for Y

$$\theta_y = -\left(\frac{\text{3.2ms delay to peak}}{\text{13.2ms period}}\right)360^0 = -87^0$$

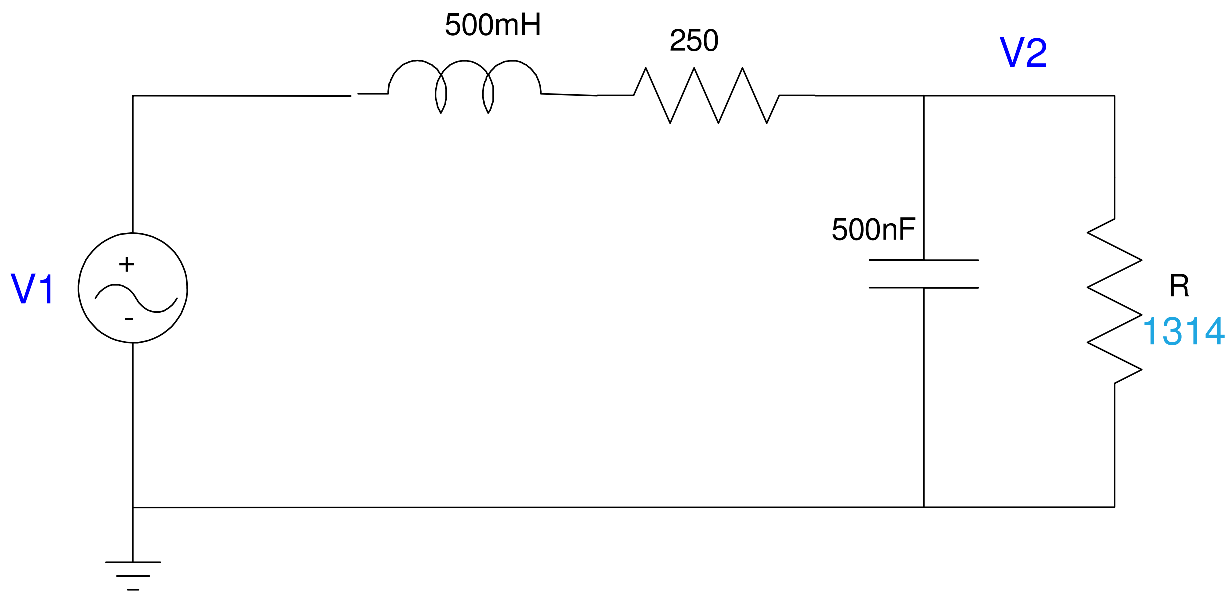
6) Determine V2(t) assuming

$$V_1(t) = 12 + 13\sin(\omega t)$$

ω = 800 + 100*(your birth month) + (your birth date). For example, May 14th would give w = 1314

w (rad/sec) 800 + 100*mo + day	V2(t)
1314	$10.08 - 8.493\cos(1314t) + 9.700\sin(1314t)$

Let R = 1314 (or any value from 800 to 2000 Ohms)



DC:

$$V_2 = \left(\frac{1314}{1314+250}\right)12V$$

$$V_2 = 10.08$$

AC:

$$V_1 = -j13$$

$$L \rightarrow j\omega L = j657\Omega$$

$$C \rightarrow \frac{1}{j\omega C} = -j1522\Omega$$

$$C||R = 752 - j649\Omega$$

$$V_2 = \left(\frac{(752-j649)}{(752-j649)+(250+j657)}\right)(-j13) = -8.493 - j9.700$$