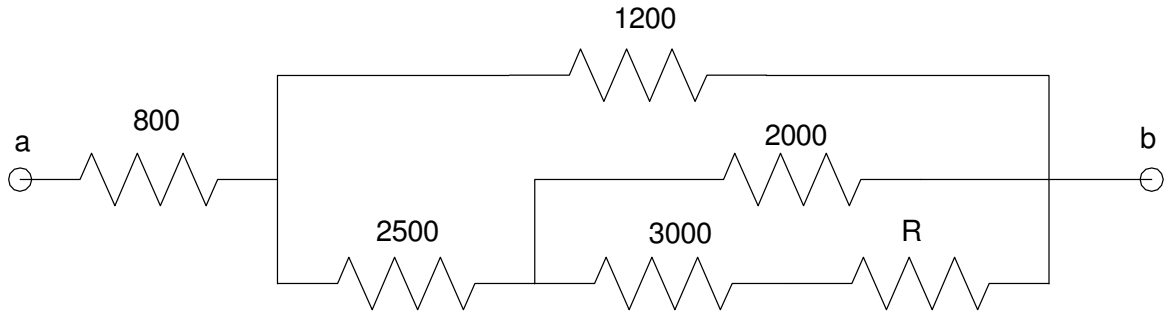
ECE 320 - Quiz #1 - Name _____

EE 206 Review. Friday, January 21st, 2022

1) Determine the resistance Rab. Assume

- R = 1200 + 100*(your birth month) + (your birth date). For example, May 14th would give R = 1714

R 1200 + 100*mo + day	Rab
1714	**1717.88 Ohms**

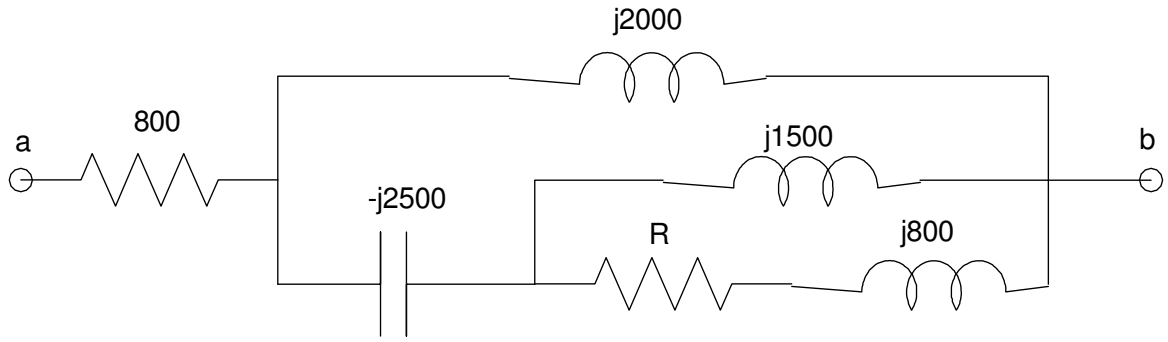


- 1714 + 3000 = 4714
- 4714 || 2000 = 1404.23
- 1404.23 + 2500 = 3904.23
- 3904.23 || 1200 = 917.88
- 917.88 + 800 = 1717.88

2) Determine the resistance Zab. Assume

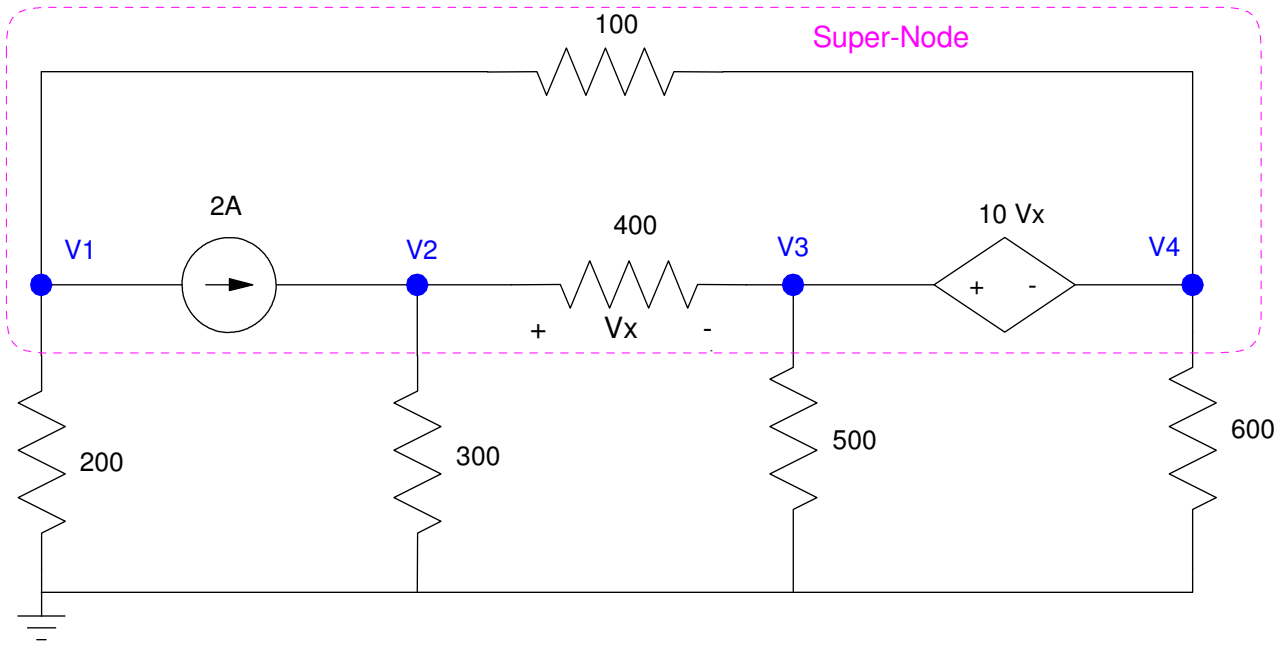
- R = 1200 + 100*(your birth month) + (your birth date). For example, May 14th would give R = 1714

R 1200 + 100*mo + day	Zab
1714	**6046.41 - j2153.05**



- R = 1714
- (1714 + j800) || (j1500) = 468.72 + j871.03
- (468.72 + j871.03) + (-j2500) = 468.72 - j1628.97
- (468.72 - j1628.97) || (j2000) = 5246.41 - j2153.05
- (5246.41 - j2153.05) + (800) = 6046.41 - j2153.05

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



Voltages:

$$V_x = V_2 - V_3$$

$$10V_x = V_3 - V_4$$

Node V1

$$\left(\frac{V_1}{200}\right) + 2 + \left(\frac{V_1 - V_4}{100}\right) = 0$$

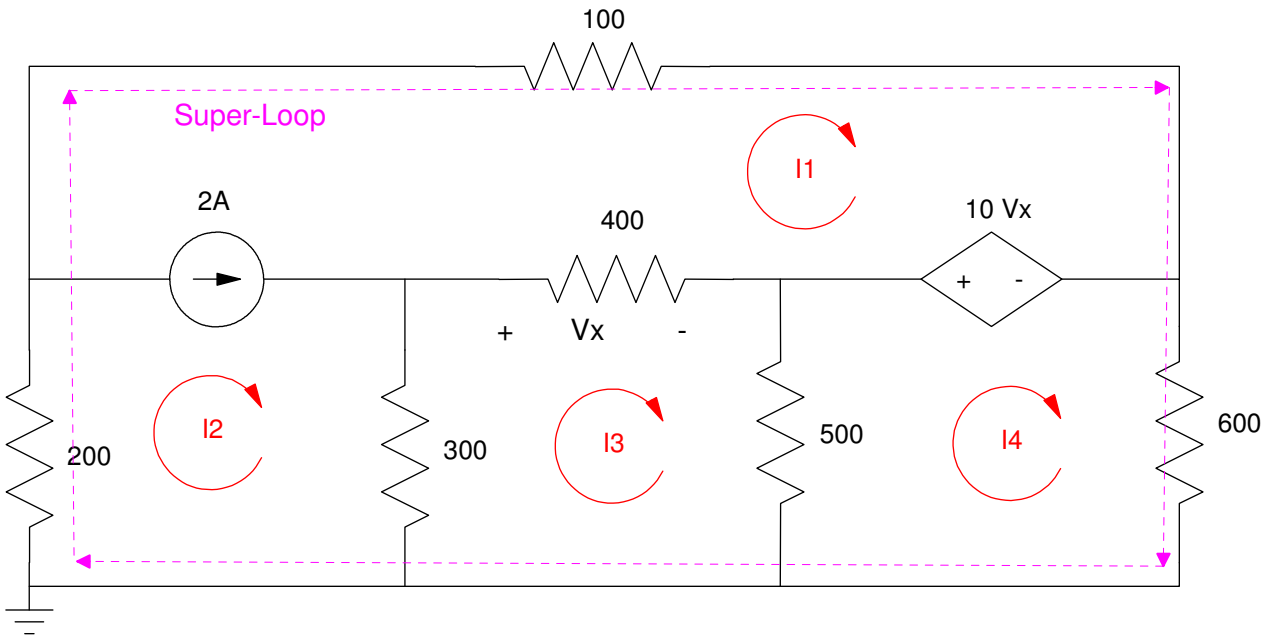
Node V2

$$-2 + \left(\frac{V_2}{300}\right) + \left(\frac{V_2 - V_3}{400}\right) = 0$$

Supernode:

$$\left(\frac{V_1}{200}\right) + \left(\frac{V_2}{300}\right) + \left(\frac{V_4}{500}\right) + \left(\frac{V_4}{600}\right) = 0$$

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



$$V_x = 400(I_3 - I_1)$$

$$I_2 - I_1 = 2$$

Loop I3:

$$300(I_3 - I_2) + 400(I_3 - I_1) + 500(I_3 - I_4) = 0$$

Loop I4

$$500(I_4 - I_3) + 10V_x + 600(I_4) = 0$$

Superloop

$$200I_2 + 100I_1 + 600I_4 = 0$$

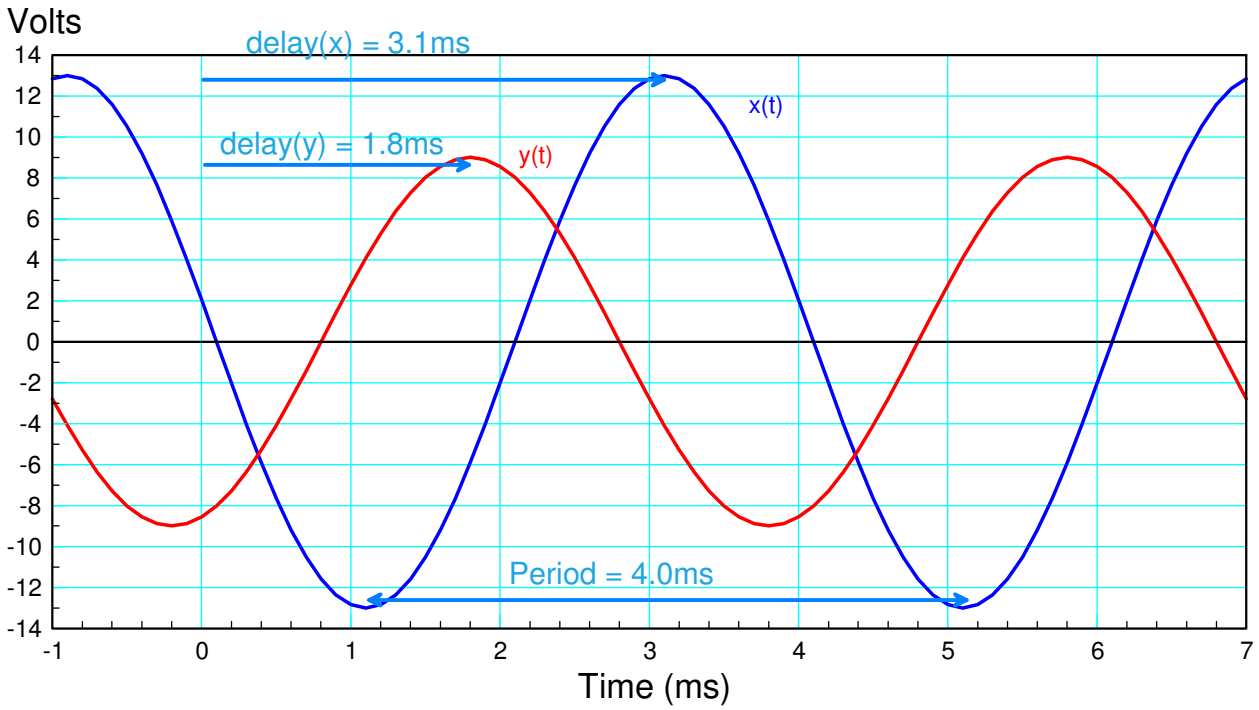
5) Signals X and Y are displayed on an oscilloscope. Give the phasor representation for these two voltages

Frequency (Hz)	X		Y	
	Amplitude	Phase	Amplitude	Phase
250Hz	**13V**	**-279 deg**	**9V**	**-162 deg**

$$f = \frac{1}{period} = \frac{1}{4ms} = 250Hz$$

$$\theta_x = -\left(\frac{3.1\text{ms delay}}{4\text{ms period}}\right)360^0 = -279^0 = +81^0$$

$$\theta_y = -\left(\frac{1.8\text{ms delay}}{4\text{ms period}}\right)360^0 = -162^0$$

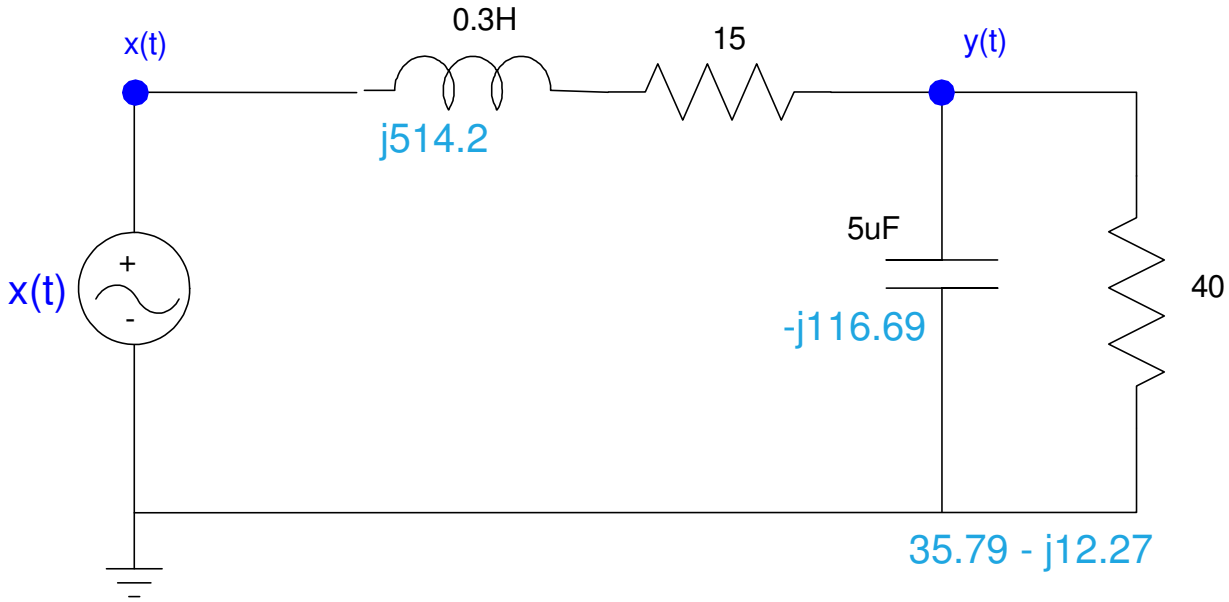


6) Determine y(t) assuming

$$x(t) = 20 + 15\sin(\omega t)$$

ω = 1200 + 100*(your birth month) + (your birth date). May 14th would result in ω = 1714 rad/sec

w (rad/sec) 1200 + 100*mo + day	y(t)
1714	**14.55 - 1.10 cos(1714t) - 0.26 sin(1714t)**



DC

$$X = 20$$

$$Y = \left(\frac{40}{40+15}\right)20 = 14.55V$$

AC

$$\omega = 1714 \text{ rad/sec}$$

$$X = 0 - j15$$

$$L \rightarrow j\omega L = j514.2\Omega$$

$$C \rightarrow \frac{1}{j\omega C} = -j116.69\Omega$$

$$100||C = 35.79 - j12.27$$

$$Y = \left(\frac{(35.79 - j12.27)}{(35.79 - j12.27)+(15+j514.2)}\right)(0 - j15) = -1.10 + j0.26$$

$$y(t) = -1.10\cos(1714t) - 0.26\sin(1714t)$$