ECE 320 - Quiz #1d - Name _____

EE 206 Review.

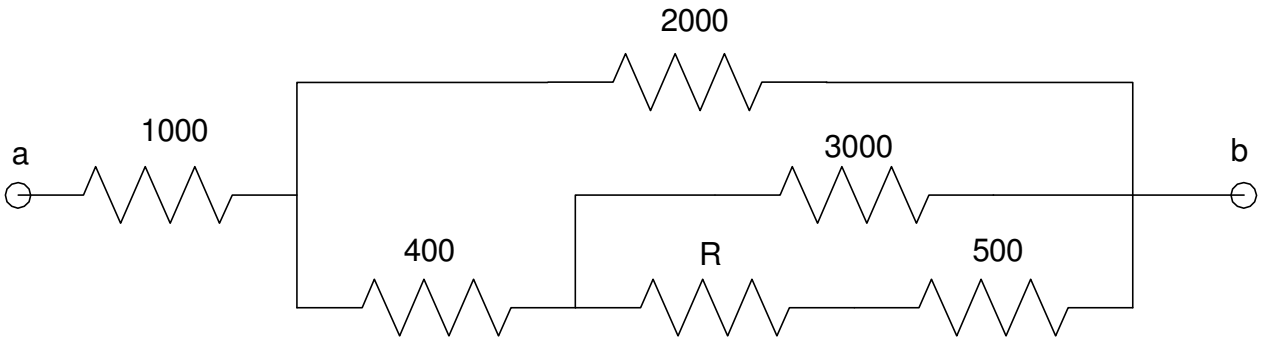
1) Let R be your birthday

R = 1000 + (month)*100 + (day)

For example, May 14th would give R = 1514 Ohms

Determine the resistance Rab

R 1000 + 100*month + day	Rab
1514	**1890.438**



1514 + 500 = 2014

2014 || 3000 = 1205.026

1205.026 + 400 = 1605.026

1605.026 || 2000 = 890.438

890.438 + 1000 = 1890.438

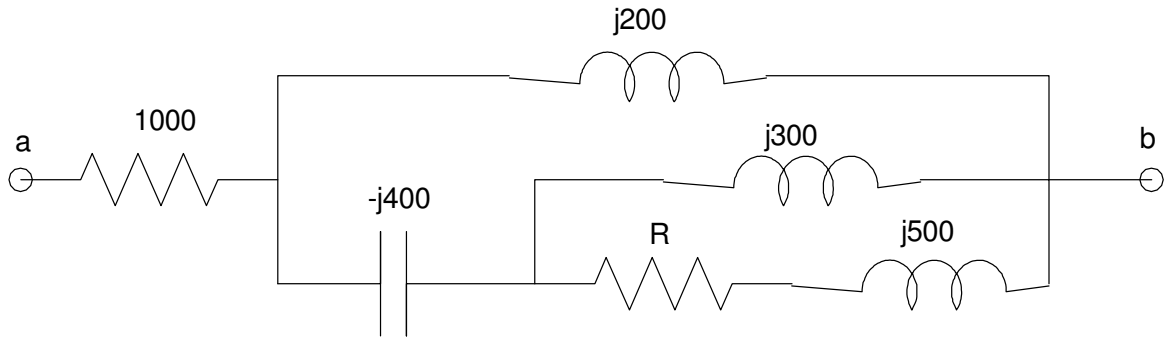
2) Let R be your birthday

R = 1000 + (month)*100 + (day)

For example, May 14th would give R = 1410 Ohms

Determine the resistace Rab (it will be a complex number)

R 1000 + 100*month + day	Zab
1514	**1236.75 - j184.36**



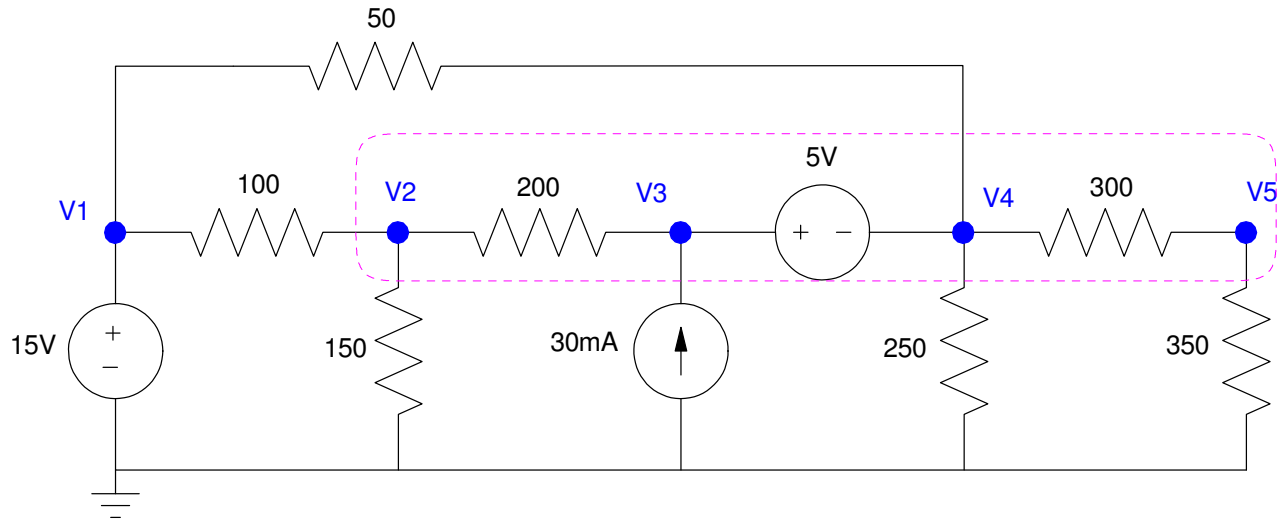
(1514 + j500) || (j300) = 46.470 + j275.445

(46.470 + j275.445) + (-j400) = (46.47 - j124.55)

(46.47 - j124.55) || (j200) = (236.75 - j184.36)

(236.75 - j184.36) + (1000) = 1236.75 - j184.36

3) Voltage Nodes. Give 5 equations to solve for the 5 unknown voltages. (you don't need to solve)



5 nodes means we need 5 equations for 5 unknowns. Start with the easy ones (voltage sources)

$$V_1 - 0 = 15$$

$$V_3 - V_4 = 5$$

node 2

$$\left(\frac{V_2 - V_1}{100}\right) + \left(\frac{V_2 - V_3}{200}\right) + \left(\frac{V_2 - 0}{150}\right) = 0$$

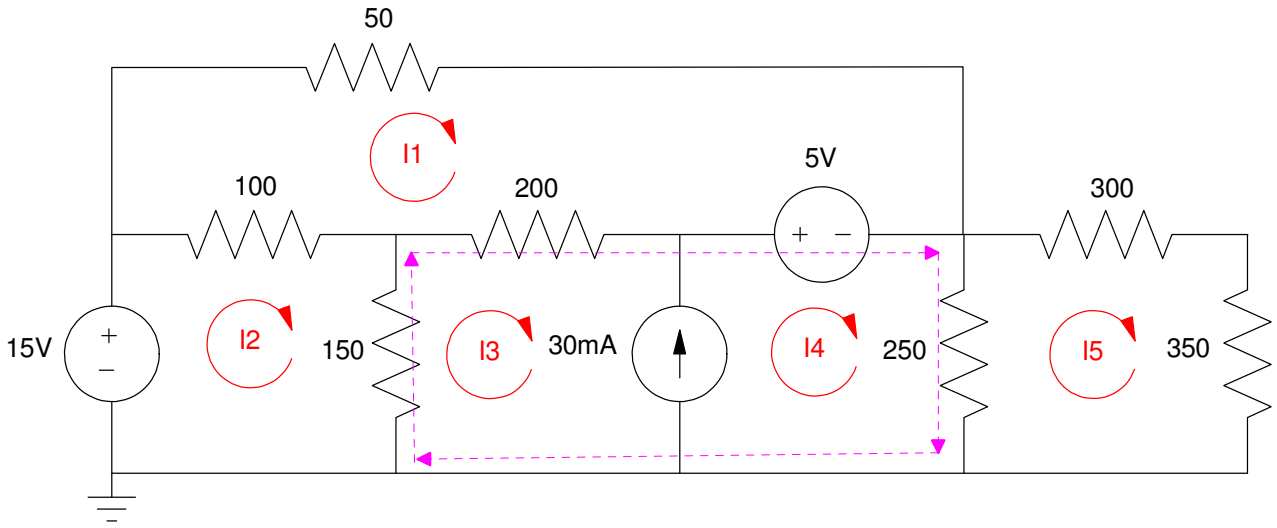
node 5

$$\left(\frac{V_5 - V_4}{300}\right) + \left(\frac{V_5 - 0}{350}\right) = 0$$

We need one more equation. Use the super node shown

$$\left(\frac{V_4 - V_1}{400}\right) + \left(\frac{V_2 - V_1}{100}\right) + \left(\frac{V_2 - 0}{150}\right) - 0.03 + \left(\frac{V_4 - 0}{250}\right) + \left(\frac{V_5 - 0}{350}\right) = 0$$

4) Current Loops. Give 5 equations to solve for the 5 unknown currents



Start with the easy ones (current sources)

$$I_4 - I_3 = 30mA$$

loop I1 $$50I_1 - 5 + 200(I_1 - I_3) + 100(I_1 - I_2) = 0$$

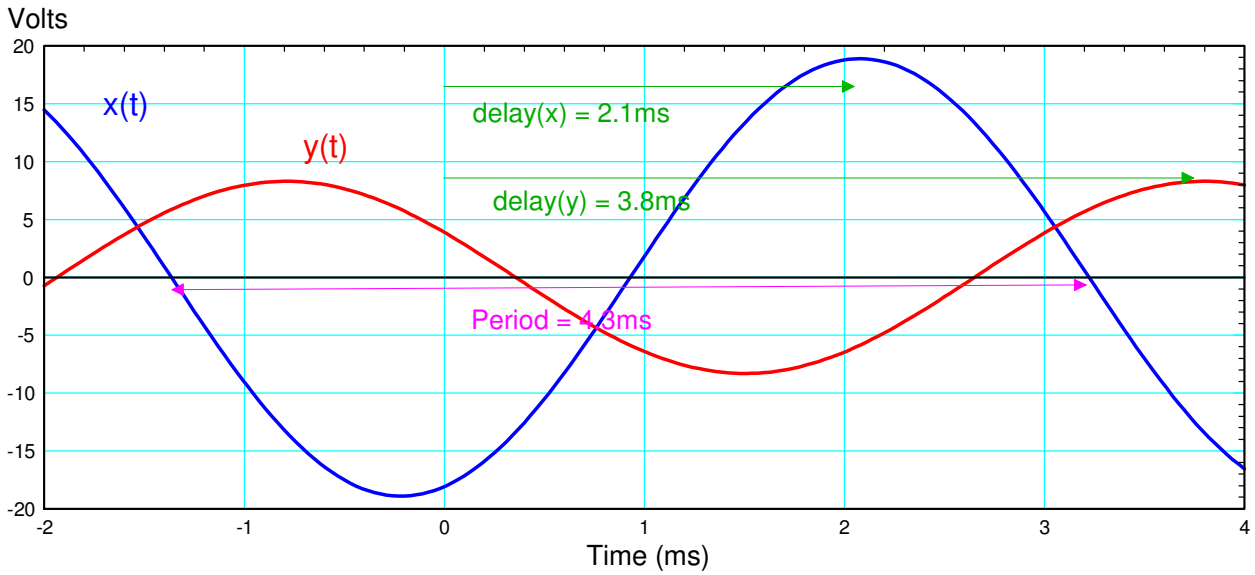
loop I2 $$-15 + 100(I_2 - I_1) + 150(I_2 - I_3) = 0$$

loop I5 $$250(I_5 - I_4) + 300(I_5) + 350(I_5) = 0$$

super loop $$150(I_3 - I_2) + 200(I_3 - I_1) + 5 + 250(I_4 - I_5) = 0$$

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
232 Hz	**19V**	**-175 deg**	**8V**	**-318 deg**



period = 4.3ms

$$f = \frac{1}{period} = 232Hz$$

$$\theta_x = -\left(\frac{\text{delay}}{\text{period}}\right)360^0 = -\left(\frac{2.1ms}{4.3ms}\right)360^0 = -176^0$$

$$\theta_y = -\left(\frac{3.8ms}{4.3ms}\right)360^0 = -318^0$$

6) Let R be your birthday

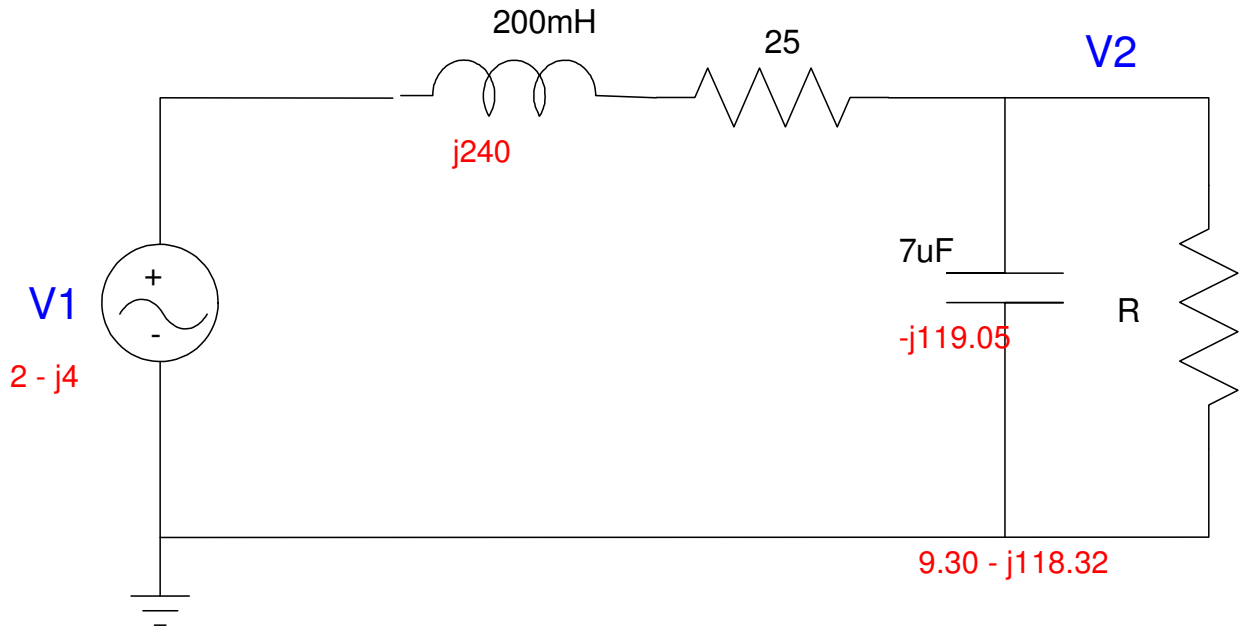
R = 1000 + (month)*100 + (day)

For example, May 14th would give R = 1410 Ohms

Determine V2(t) assuming

$$V_1(t) = 15 + 2\cos(1200t) + 4\sin(1200t)$$

R =	**1514 Ohms**
V2(t) =	**14.76 - 3.04 cos(1200t) - 2.90 sin(1200t)**



DC:

$$V_2(DC) = \left(\frac{1514}{1514+25}\right)15 = 14.76V$$

AC (1200 rad/sec):

$$V_2(AC) = \left(\frac{(9.30-j118.32)}{(9.30-j118.32)+(25+j240)}\right)(2-j4)$$

$$V_2(AC) = -3.04 + j2.90$$

meaning

$$v_2(t) = -3.40\cos(1200t) - 2.90\sin(1200t)$$