

ECE 320 - Quiz #1b - Name _____

EE 206 Review. January 28, 2021

Open book, open notes. Calculators permitted. Individual Effort.

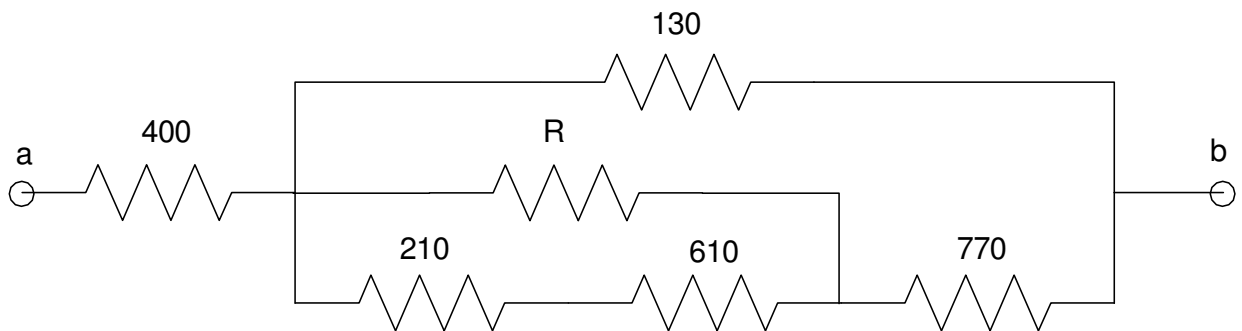
1) Let R be your birthday

$$R = 1000 + (\text{month}) * 100 + (\text{day})$$

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

Determine the resistance R_{ab}

R $1000 + 100 * \text{month} + \text{day}$	R_{ab}
1514 Ohms	518.198 Ohms



$$210 + 610 = 820 \quad \text{series}$$

$$820 \parallel 1514 = 531.911 \quad \text{parallel}$$

$$531.911 + 770 = 1301.911 \quad \text{series}$$

$$1301.911 \parallel 130 = 118.198 \quad \text{parallel}$$

$$118.198 + 400 = 518.198 \quad \text{series}$$

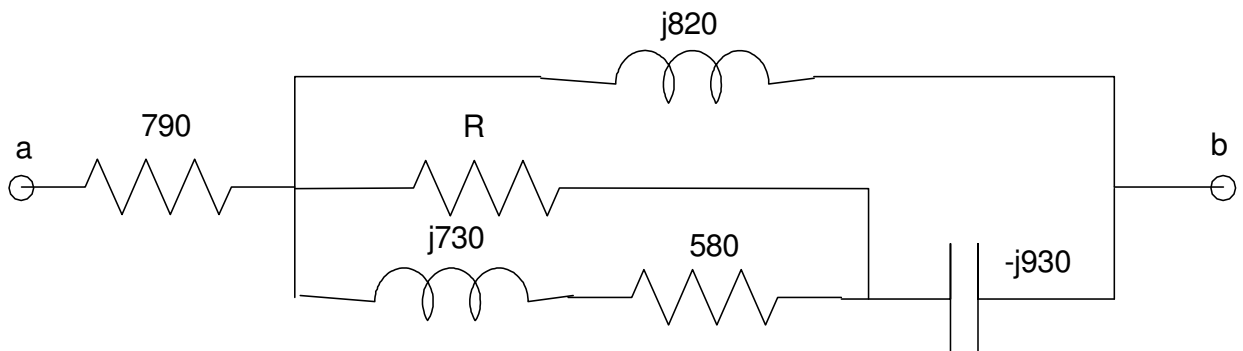
2) Let R be your birthday

$$R = 1000 + (\text{month}) * 100 + (\text{day})$$

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

Determine the resistance Z_{ab} (it will be a complex number)

R 1000 + 100*month + day	Z_{ab}
1514 Ohms	$1846.362 + j367.862$



$$1514 \parallel (580 + j730) = 537.970 + j340.259$$

$$(537.970 + j340.259) + (-j930) = 527.970 - j589.741$$

$$(527.970 - j589.741) \parallel (j820) = 1056.362 + j367.862$$

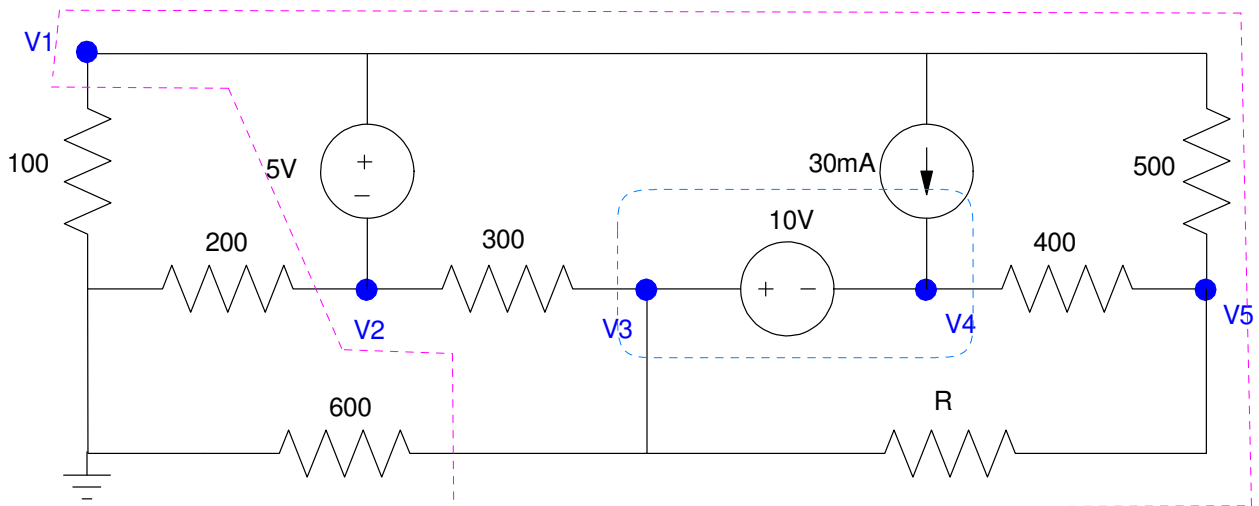
$$(1056.362 + j367.862) + 790 = 1846.362 + j367.862$$

3) Voltage Nodes. Let R be your birthday

$$R = 1000 + (\text{month}) * 100 + (\text{day})$$

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

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



$$V_1 - V_2 = 5$$

$$V_3 - V_4 = 10$$

$$\left(\frac{V_5 - V_1}{500} \right) + \left(\frac{V_5 - V_4}{400} \right) + \left(\frac{V_5 - V_3}{1514} \right) = 0$$

pink supernode

$$\left(\frac{V_1}{100} \right) + \left(\frac{V_2}{200} \right) + \left(\frac{V_3}{600} \right) = 0$$

blue supernode

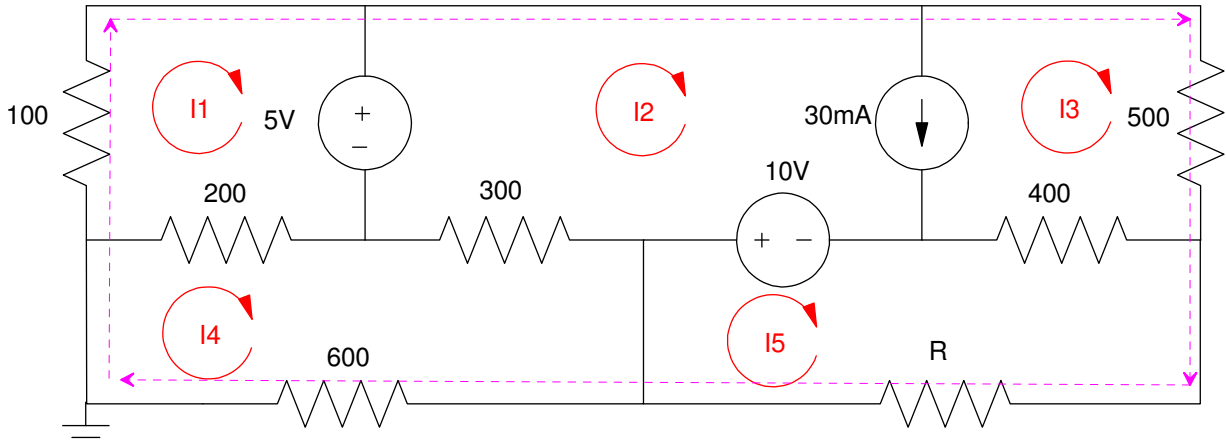
$$\left(\frac{V_3 - V_2}{300} \right) + \left(\frac{V_3}{600} \right) + \left(\frac{V_3 - V_5}{1514} \right) - 30mA + \left(\frac{V_4 - V_5}{400} \right) = 0$$

4) Current Loops. Let R be your birthday

$$R = 1000 + (\text{month}) * 100 + (\text{day})$$

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

Give 5 equations to solve for the 5 unknown currents



$$I_2 - I_3 = 30mA$$

$$100I_1 + 5 + 200(I_1 - I_4) = 0$$

$$200(I_4 - I_1) + 300(I_4 - I_2) + 600I_4 = 0$$

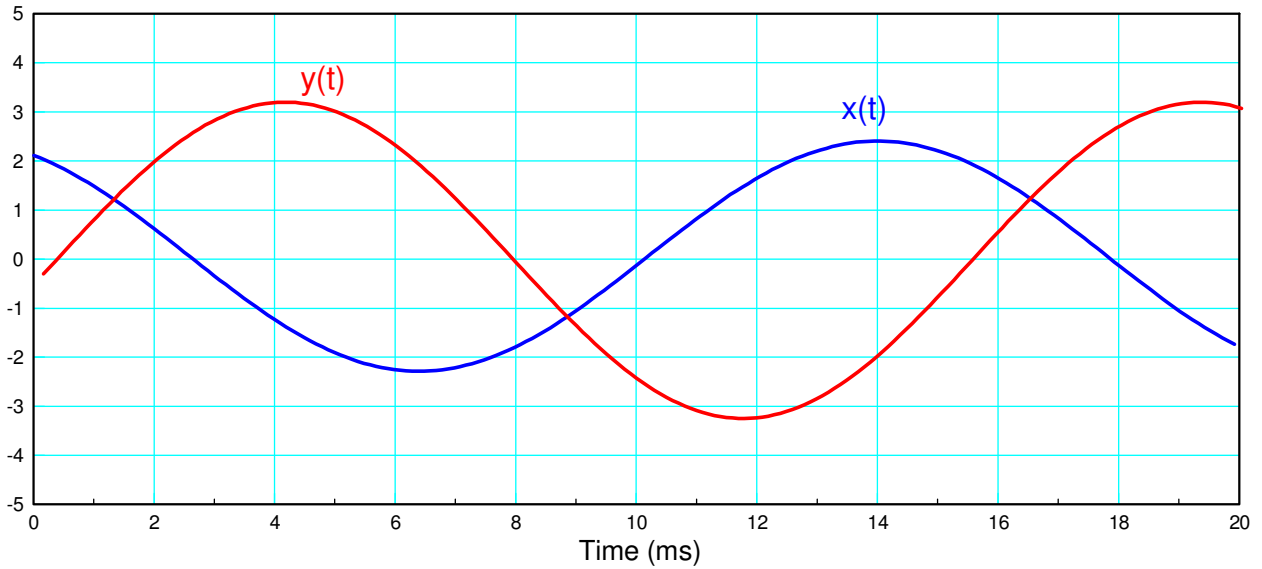
$$10 + 400(I_5 - I_3) + 1514I_5 = 0$$

superloop

$$100I_1 + 500I_3 + 1514I_5 + 600I_4 = 0$$

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
65.8Hz 15.2ms period	2.3V	-331 deg	3.2V	-94.7 deg



Period = 15.2ms (time between peaks)

frequency = 1 / period = 65.8Hz

phase(x)

delay to peak = 14ms

$$\theta_x = -\left(\frac{14ms}{15.2ms}\right) 360^\circ = -331.579^\circ$$

phase(y)

delay to peak = 4ms

$$\theta_y = -\left(\frac{4ms}{15.2ms}\right) 360^\circ = -94.373^\circ$$

6) Let R be your birthday

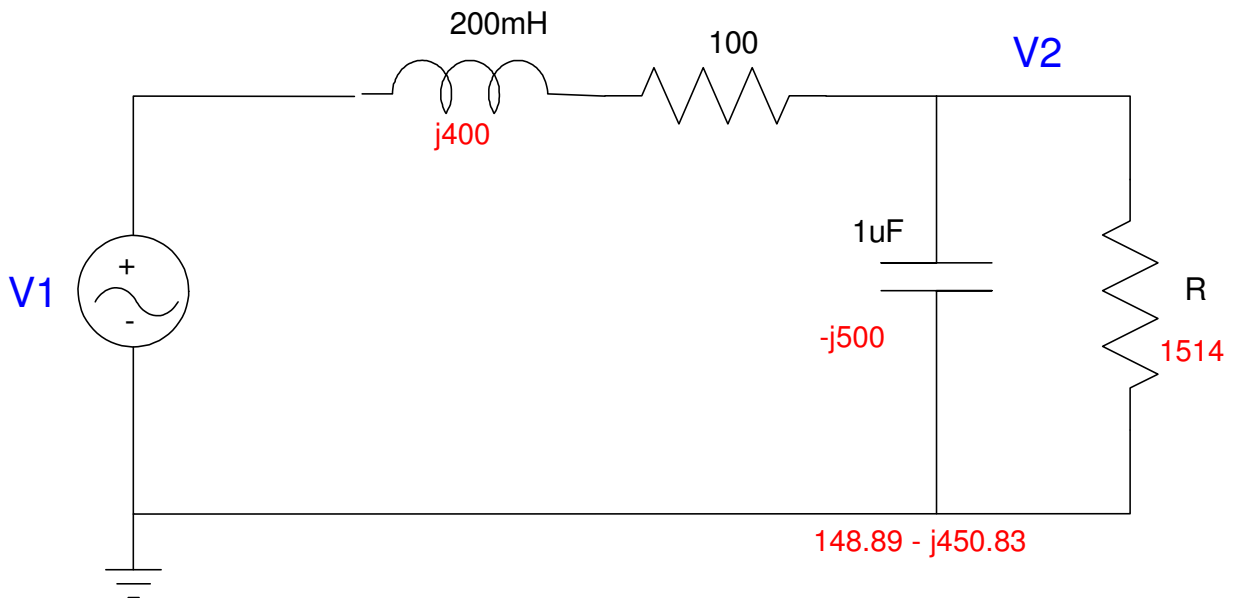
$$R = 1000 + (\text{month}) * 100 + (\text{day})$$

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

Determine $V_2(t)$ assuming

$$V_1(t) = 15 + 7 \cos(2000t) + 5 \sin(2000t)$$

R =	1514
V2(t) =	14.071 - 1.602 cos(200t) + 15.998 sin(2000t)



DC

$$V_2 = \left(\frac{1514}{1514+100} \right) 15V = 14.07V$$

$$v_2(t) = 14.07$$

AC

$$V_2 = \left(\frac{148.89+j450.83}{(148.89+j450.83)+(100+j400)} \right) (7-j5)$$

$$V_2 = -1.602 - j15.998$$

$$v_2(t) = -1.602 \cos(2000t) + 15.998 \sin(2000t)$$

The total answer is DC + AC

