

Desk Copy

ECE 300
Spring Semester, 2007
HW Set #10

Due: April 3, 2007

Name Wlg
Print (last, first)

wlg

Use engineering paper. Work only on one side of the paper. Use this sheet as your cover sheet, placed on top of your work and stapled in the top left-hand corner. Number the problems at the top of the page, in the center of the sheet. **Do neat work. Underline your answers. Show how you got your equations. Be sure to show how you got your answers.** Each problem counts 10 points.

9.19 (a) $3.32\cos(20t + 114.49^\circ)$; (b) $64.8\cos(50t - 70.89^\circ)$

9.36 $i(t) = 266.1\cos(200t - 3.9^\circ)$ mA

9.41 $v(t) = 6.325\cos(t - 18.43^\circ)$ V

9.43 $I_o = 499.7\angle -28.85^\circ$ mA

9.60 $Z = 51.1 + j9.88$ Ω

9.65 $Z_T = 6.917\angle 9.1^\circ$ Ω

$I = 17.35\angle 0.9^\circ$ A

wlz

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H.W. #10
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(9.19)

(a) FIND

$3 \cos(20t + 10^\circ) - 5 \cos(20t - 30^\circ)$
as a single cosine function.

$$3 \cos(20t + 10^\circ) = 3 \angle 10$$

$$5 \cos(20t - 30^\circ) = 5 \angle -30$$

$$(3 \angle 10^\circ) - (5 \angle -30^\circ) = 3.32 \angle 114.8$$

$$\therefore \text{Ans} = 3.32 \cos(20t + 114.8^\circ)$$

1b)

$$4 \sin 50t + 30 \cos(50 - 45^\circ)$$

$$40 \cos(50t - 90^\circ) + 30 \cos(50 - 45^\circ)$$

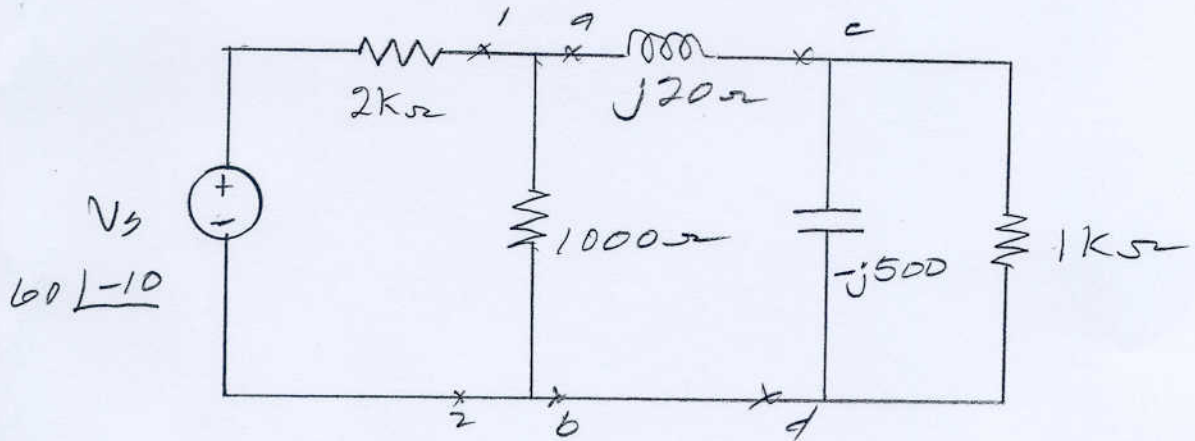
$$(40 \angle -90^\circ) + (30 \angle -45^\circ) = 64.8 \angle -70.89^\circ$$

$$\text{Ans} = 64.8 \cos(50t - 70.89^\circ)$$

9.36

For the following circuit
determine i . Assume

$$V_s = 60 \cos(200t - 10^\circ) \text{ V}$$



$$j\omega L = j200 \times 0.1 = j20\Omega$$

$$\frac{-j}{0.2 \times 10^{-3} \times 10 \times 10^{-6}} = -j500$$

$$1\text{K} \parallel (-j500) = \frac{(500 \angle -90^\circ)(1000)}{1000 - j500}$$

$$Z_{cd} = 200 - j400$$

$$Z_{ab} = Z_{cd} + j20 = 200 - j380$$

$$Z_{12} = 1000 \parallel Z_{ab}$$

$$= \frac{(1000)(200 - j380)}{1000 + 200 - j380}$$

$$Z_{12} = 242.62 - j239.84$$

$$Z_{in} = 2000 + 242.62 - j239.84$$

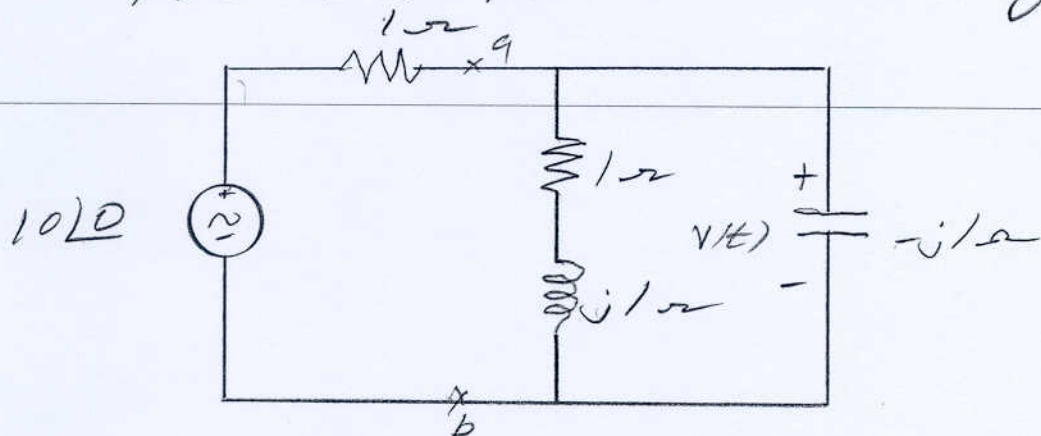
$$Z_{in} = 2255.41 \angle -6.10^\circ \Omega$$

$$I = (60 \angle -10^\circ) / (2255 \angle -6.10^\circ) = 26.6 \angle -3.9^\circ \times 10^{-3}$$

$$i(t) = 26.6 \cos(200t - 3.9^\circ) \text{ mA}$$

9.41

FIND $v(t)$ for the following circuit.

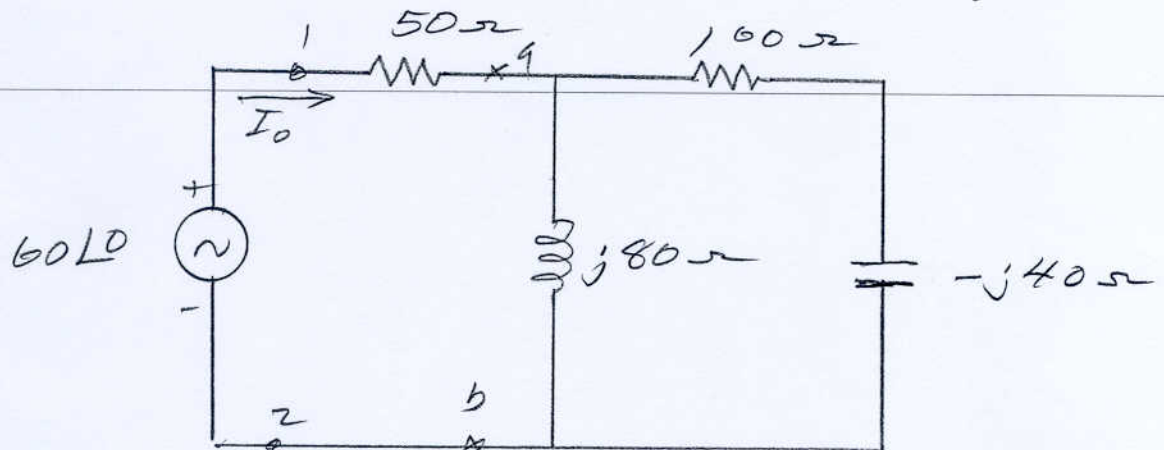


$$Z_{ab} = \frac{(1+j1)(1\angle -90^\circ)}{1+j1-j1} = 1-j1$$

$$\hat{V} = \frac{(10\angle 0)(1-j1)}{1+j1-j1} = 6.32\angle -18.43^\circ \text{ V}$$

$$v(t) = 6.32 \cos(t - 18.43^\circ) \text{ V}$$

(9.43) Find I in the following ckt.



$$Z_{ab} = \frac{(j80)(100 - j40)}{100 + j80 - j40} = 55.17 + j57.93$$

$$Z_{12} = 50 + 55.17 + j57.93$$

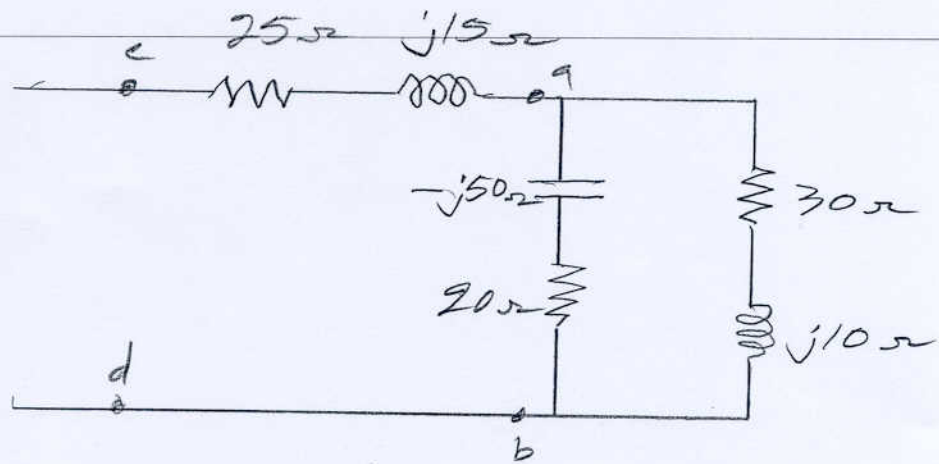
$$Z_{12} = 105.17 + j57.93 \Omega$$

$$\vec{I}_0 = \frac{60}{(105.17 + j57.93)} = 0.5 \angle -28.89^\circ \text{ A}$$

$$\vec{I}_0 = 0.5 \angle -28.89^\circ \text{ A}$$

(9.60)

Find Z_{in} for the following



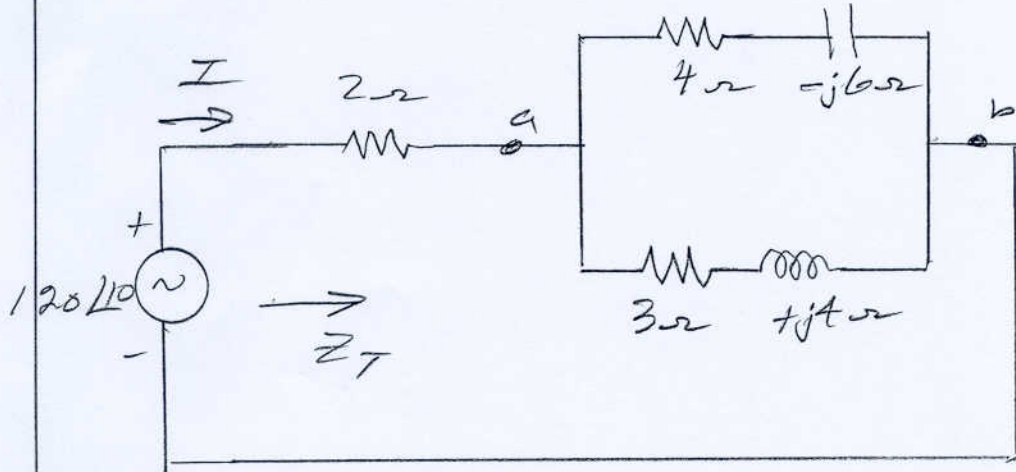
$$Z_{ab} = \frac{(20 - j50)(30 + j10)}{20 - j50 + 30 + j10}$$

$$Z_{ab} = 26.1 - j5.12$$

$$Z_{cd} = Z_{in} = 25 + j15$$

$$Z_{in} = 51.1 + j9.88 \Omega$$

9.65 Determine Z_{in} for the following circuit. Also determine I



$$Z_{ab} = \frac{(4 - j6)(3 + j4)}{4 - j6 + 3 + j4} = 4.83 - j1.09 \Omega$$

$$Z_T = 2 + Z_{ab}$$

$$Z_T = 6.83 - j1.09 \Omega = 6.916 \angle -9.07^\circ \Omega$$

$$I = \frac{120 \angle 10^\circ}{6.916 \angle -9.07^\circ} = 17.35 \angle 19.07^\circ \text{ A}$$