ENGR 12 Assignment 10 Due: next wed

Part I. Drills -- 1 point each

For questions 1 and 2, assume a = 3 – 4j, b = –6j, c = 8<-45°, d = 15<250°

1) Express the following in Rectangular form:	2) Express the following in Polar form:
a. (a + b) 3-10j	a. b 6 < -90
b. (a / b) .667 + .5j	b. b* 6<+90
c. c 5.657 – 5.657j	c. c/d .533 < 65
d. c* 5.657 + 5.657j	d. a b 30<-143
e. (c + d) .5266 -19.75j	e. a + d 18.22 <-96.7

3) Complete the missing cells of the table defining three sinusoids and express each as

$$i(t) = Im\cos(\omega t + \varphi)$$

	Amplitude	Cyclic Frequency	Angular Frequency	Period	Peak-to-Peak	Phase
$i_1(t)$	7.5 mA	159.2 Hz	1000 rad/s	6.28 ms	15 mA	45°
$i_2(t)$	5A	20 Hz	125.6 R/s	50 ms	10 mA	0°
$i_3(t)$	1.5 mA	25,000 Hz	157 kRad/s	40 μs	3 μA	–90°

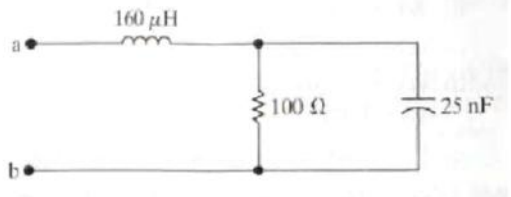
i1(t) = 7.5cos(1000t + 45°) mA
i2(t) = 5cos(125.6t) A
i3(t) = 1.5 cos(157027t -90°)

4) Use the concept of a phasor to convert the following expressions into a simpler form:

a. 100cos(500t – 43°) + 45cos(500t + 120°) 58.46<-30
b. 200cos(377t + 75°) + 50sin(377t – 100°) 201.8 < 89.3
c. 5cos(wt) + 5cos(wt+120°) + 5cos(wt-120°) 0

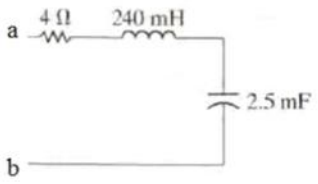
5) Find the complex impedance AND admittance of the following at a-b, given w = 5000 Radians/sec, express in both polar and rectangular form:

a) w = 5000, ZC = -j/(wC) = -8000j, ZL = 0.8j
Zab = ZL + ZC||R = 99.9844 - 0.4498i = 99.985 < -0.26°



Yab = 1/Zab= .01 + 0i = .01 < .26°

b) ZL = 1200j, ZC = -.08j,
Zab =4+1199i = 1199 < 89.81°



Yab = 1/Zab = (2.78 – 834j) x10^-6
= 834x10^-6 < -89.8°

Part II. Assisted Problem Solving – 2 pts

6) Find the the current through the 25nF cap in 5a) when a current source of $10\cos(5000t + 120^\circ)$ is applied at a-b. Express your answer in both phasor and time-domain form	Plan 1) Convert the source current into phasor form 2) Use the current divider formula to find phasor Ic 3) Convert phasor Ic to time domain Is = 10<120 Ic = Is*100/(100 + ZC) ZC = -8000j Ic = .125 < -150 ic = .125 $\cos(5000t - 150^\circ)$ A
7) Find the voltage across the 2.5mF cap in 5b) when a voltage source of $50\cos(5000t - 90^\circ)$ is applied at a-b. Express your answer in both phasor and time-domain form	PLAN 1) Convert the source voltage into phasor form 2) Use the voltage divider formula to find phasor Vc 3) Convert phasor Vc to time domain Vs = 50<-90 Vc = Vs* ZC/(R + ZL + ZC) Vc =0.003 < 90.19 vc = 3 $\cos(5000t + 90.19^\circ)$ mV

Part III. Unassisted Problem Solving – 3 points

8) What value of w will the impedance at a-b in problem 5b become purely resistive?

when $jwL - j/(wC) = 0$

$wL = 1/wC$

$w^2L = 1/C$

$w = 1/\text{sqrt}(LC) = 40.824$ rad/sec