EECS 40, Fall 2007
Prof. Chang-Hasnain

Homework #4

Due at 5 pm in 240 Cory on Thursday, 10/04/07
Total Points: 100

- Put (1) your name and (2) discussion section number on your homework.
- You need to put down all the derivation steps to obtain full credits of the problems. Numerical answers alone will at best receive low percentage partial credits.
- No late submission will be accepted expect those with prior approval from Prof. Chang-Hasnain.
- Problems of this HW are from Hambley 4th Edition

1. P4.57 (Second-Order Circuits) (5 points)

2. P4.61 (Second-Order Circuits) (20 points, 5 per part) Note: for part b that there is a misprint: v'(0+)=109 V/s should be v'(0+)=10^9 V/s

3. P5.10 (Sinusoidal Currents and Voltages) You may also sketch the Lissajous figures by hand. (12 points, 3 per plot)

4. P5.16 (RMS-value) (6 points)

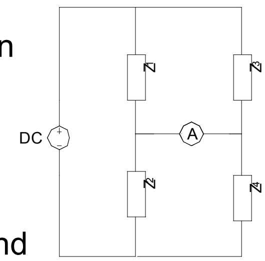
5. Elementary operations (Complex Arithmetic) (12 points, 2 each)
   Perform the following operations:

   a) $(5+j3)+(3-j7)=$
   b) $(2+j5)-(9+j4)=$
   c) $(7+j8)(4-j2)=$
   d) $\dfrac{(1+j3)}{(4+j9)}=$
   e) Convert $(1+j3)$ into polar form.
   f) Convert $2e^{j35^\circ}$ into rectangular form.

6. P5.25 (Phasors) (10 points)

7. P5.24 (Phasors) (8 points)

8. Wheatstone Bridge (Complex Impedances) (17 points)
The circuit on the right hand side shows a generalized version of the Wheatstone Bridge. Z_1, Z_2, Z_3, Z_4 are complex impedances.



a) Derive the condition for the current through the amperemeter to be zero.
b) Let $f = 60Hz$, Z_1 consists of a 60Ω resistor and a 0.2H inductance, Z_2 is a 100Ω resistor. Z_3 consists of a 200Ω resistor and a 50 µF capacitor. Calculate the complex impedances of Z_1, Z_2, Z_3.
c) Calculate Z_4 such that there is no current flowing through the amperemeter.
d) With which circuit elements can you construct Z_4?

9. P5.38 (Complex Impedances) (10 points)