Phys 208 – Homework (HW10) – SP13 (Due Monday, February 18, 2013)

Problems: 2.16.6(b), 2.16.7(a), 2.16.8, 2.16.9, 2.16.10

Answers: 2.16.7(a) Series: $1+2i$ Parallel: $3(3-i)/5$

2.16.9(a) $\omega = \frac{R}{2L} + \sqrt{\frac{R^2}{4L^2} + \frac{1}{LC}}$ (b) $\omega = 1/\sqrt{LC}$

HW10.1 In an R-L-C series circuit, the source has a constant voltage amplitude of 50 V and an angular frequency ω = 1000 rad/sec. R = 300 Ω, L = 0.9 H, and C = 2.0 μF.

a) What is the impedance of the circuit? b) What is the current amplitude?

c) What are the voltage amplitudes across the resistor, inductor, and capacitor?

d) Determine the current phase angle ϕ. Does the current lead or lag the applied voltage?

e) What power is consumed in the circuit?

f) Determine the resonant angular frequency of the circuit.

g) What is the current amplitude at resonance?

h) What power is consumed in the circuit at resonance?

Answers: HW11.1 (a) $Z = 300\,\Omega + i\,400\,\Omega$ (b) 0.1 A
(c) $V_R = 30\,V$, $V_L = 90\,V$, $V_C = 50\,V$

(d) Phase angle equals 53.1 degrees. Current lags the voltage.

(e) 1.5 W (f) 745 rad/sec (g) 0.167 A (h) 4.17 W

Phys 208 – Homework (HW11) – SP13 (Due Wednesday, February 20, 2013)

HW 11.1 An AC-circuit consists of a resistor and capacitor in series. The source has a voltage amplitude of 50 V and an angular frequency ω = 1000 rad/s. $R = 300\,\Omega$ and $C = 2\mu$F.

a) What is the magnitude of the impedance of the circuit?

b) What is the current amplitude?

c) What are the voltage amplitudes across the resistor and across the capacitor?

d) What is the phase angle ϕ? Does the current lag or lead the source voltage?

e) Determine the power consumed in the circuit.

f) Construct the phasor diagram.

HW 11.2 A 100 Ω resistor, a 0.1 μF capacitor, and a 0.1 H inductor are connected in parallel to a voltage source with amplitude 100 V.

a) What is the resonant angular frequency?

b) What is the maximum total current through the parallel combination at resonance?

c) What is the maximum current in the resistor, inductor, and capacitor at resonance?

HW 11.3 A circuit draws 330 W from a 110 V, 60 Hz AC-line. The power factor is 0.6 and the current lags the voltage. Note: The 110 V is the V_{rms} (or root-mean-square voltage) of the line.

a) Find the capacitance of the series capacitor that will result in a power factor of unity.

b) What power will then be drawn from the power line?

Answers: HW 11.1 a) 583 Ω b) 0.0858 A c) 25.7 V, 42.9 V d) 59°, leads e) 1.10 W

HW 11.2 a) $\omega_0 = 10^4$ rad/s b) 1 A c) 1 A, 0.1 A, – 0.1 A

HW 11.3 a) 151 μ F b) 917 W

Read the following: Ch 4-Sect 11 Change of variables
Ch 4-Sect 12 Differentiation of integrals; Leibniz' Rule
Ch 5- Sect 4 Change of variables in integrals; Jacobians

Problems: Ch 4 – 4.11.1, 4.11.6, 4.11.7

Test 1 Friday, February 22, 2013