

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
 PHYSICS DEPARTMENT
 PHYS 201- Term 112
 QUIZ #2 - CHAPTER 32

Wednesday 22 February 2012

Name: Key ID#: _____

An ac generator with $\mathcal{E}_m = 120 \text{ V}$ and operating at 200 Hz causes oscillations in a series RL circuit having $R = 100 \Omega$ and $L = 0.5 \text{ H}$.

- Find the impedance.
- Find the current amplitude.
- Find the voltage amplitude across the resistor.
- Find the voltage amplitude across the inductor.
- Find the phase constant for this circuit.
- Write the expression of the oscillating current as a function of time in the circuit.
- Draw the phasor diagram for this circuit.

$$a) Z = \sqrt{R^2 + (L\omega_d)^2} = \sqrt{(100)^2 + (0.5 \times 2 \times \pi \times 200)^2} = \sqrt{(100)^2 + (628.3)^2}$$

$$\boxed{Z = 636 \Omega}$$

$$b) I = \frac{\mathcal{E}_m}{Z} = \frac{120}{636} = \boxed{0.189 \text{ A}}$$

$$c) V_R = IR = \boxed{18.9 \text{ V}}$$

$$d) V_L = IX_L = I\omega_d L = \boxed{118.7 \text{ V}}$$

$$e) \phi = \tan^{-1}\left(\frac{X_L}{R}\right) = \tan^{-1}\left(\frac{\omega_d L}{R}\right) = \tan^{-1}\left(\frac{628.3}{100}\right) = \tan^{-1}(6.28)$$

$$\boxed{\phi = 81^\circ} = \boxed{1.41 \text{ rad}}$$

$$f) i = I \sin(\omega_d t - \phi) = 0.189 \sin(1256.6t - 1.41)$$

