#3 $\quad U_E = \dfrac{q^2}{2C}$, $C = \dfrac{q^2}{2U_E}$, $q^2 = 1.6 \times 10^{-6} C$

$$U_E = 140 \times 10^{-6} J$$

#7 $\qquad q \xrightarrow{\text{corrosponds}} x$

$\qquad\qquad i \longrightarrow \upsilon$

$\qquad\qquad \dfrac{1}{C} \longrightarrow K$

$\qquad\qquad L \longrightarrow m$

a. $\qquad \dfrac{1}{2} m \upsilon^2$

$\qquad\qquad L = 1.25 H$

$\qquad\qquad m = 1.25 kg$

b. $\qquad K = \dfrac{1}{C} = \dfrac{2U_E}{q^2} = - - - -$

c. $\quad U = \dfrac{1}{2} K A^2$

$\qquad\qquad A = \sqrt{\dfrac{2U}{K}}$

d. $\qquad U = \dfrac{1}{2} m \upsilon^2$

$\qquad\qquad \upsilon = \sqrt{\dfrac{2U}{m}}$

#19

a.
$$q = Q \sin(\omega t)$$

$$i = Q\omega \cos(\omega t)$$

$$i_{max} = Q\omega = 2.0 A$$

$$Q = \frac{i_{max}}{\omega}$$

where $\omega = \frac{1}{\sqrt{LC}}$

b.
$$U = \frac{1}{2} \frac{q^2}{2C}$$

$$\frac{dU}{dt} = \frac{1}{2C} (2q) \frac{dq}{dt} = 0$$

Because $\frac{dU}{dt} = 0$ at the maxima.

$\therefore$ $q \cdot \frac{dq}{dt} = 0$

$$(Q \sin(\omega t))(Q\omega) \cos(\omega t) = 0$$

$$\sim \quad \sin(2\omega t) = 0$$

#19 Cont

$$\Rightarrow 2\omega t = \pi$$

$$t = \frac{\pi}{2\omega}$$

$$\omega = \frac{1}{\sqrt{LC}}$$

C ⟂

$$U = \frac{q^2}{2C} = \frac{Q^2}{2C} \sin^2(\omega t)$$

$$t = \frac{\pi}{2\omega}$$

26

$$q = q e^{-\frac{Rt}{2L}} \cos(\omega' t)$$

$$U_E = \frac{q^2}{2C} = \frac{q^2}{2C} e^{-\frac{Rt}{L}}$$

$$U_{max} = \frac{q^2}{2C}$$

$$\therefore U_E = U_{max} \, e^{-\frac{Rt}{L}}$$

$$\therefore \quad \frac{U_E}{U_{max}} = \frac{1}{2} = e^{-\frac{Rt}{L}}$$

$$\therefore \quad \frac{Rt}{L} = \ln(2)$$

$$t = \frac{L \ln(2)}{R}$$

29

$$i_L = I_L \sin\left(\omega_d t - \frac{\pi}{2}\right)$$

$$I_L = \frac{V_L}{X_L} = \frac{\varepsilon_m}{\omega_d L}$$

$$\omega_d = 2\pi f = 2000\pi$$

$$\therefore \quad I_L = \frac{30}{2000\pi \times 50 \times 10^{-3}}$$

$$I_L = \frac{30}{100\pi} = 95.5 \, mA$$

#29

b. $\omega_d = 2\pi f = 2\pi \times 8000$.

#36. From the graph
the resonance frequency

$\omega = \omega_d = 25 \times 10^3$ rad/s.

$$\omega = \frac{1}{\sqrt{LC}}$$

$$LC = \frac{1}{\omega^2} = \frac{1}{(25 \times 10^3)^2}$$

a. $C = \frac{1}{2 \times 10^{-4} \times 625 \times 10^6}$

$$= \frac{1}{1250 \times 10^2}$$

$$= 8 \, \mu F$$

b. $I_{max} = \frac{\varepsilon_m}{R}$

$R = \frac{\varepsilon_{max}}{I_{max}} = \frac{8}{4} = 2 \, \Omega$

Note $I_{max} = 4A$, from graph.

41, $\tan\phi = \dfrac{X_L - X_C}{R}$

$$R = \dfrac{X_L - X_C}{\tan\phi}$$

$$X_L = W_d L = 2\pi \times 930 \times 88 \times 10^{-3}$$

$$X_C = \dfrac{1}{W_d C} = \dfrac{1}{2\pi \times 930 \times 0.99 \times 10^{?}}$$

$$\phi = 75^\circ$$

Solve for R

53.

a. $Z = \sqrt{R^2 + X_L^2}$

$$= \sqrt{144 + (1.3)^2}$$

$$= \sqrt{145.69}$$

$$\approx 12.1 \, \Omega$$

b. $P_{av} = \mathcal{E}_{rms} \cdot I_{rms} \cdot \cos\phi$

$\mathcal{E}_{rms} = 120 \, V$, $I_{rms} = \dfrac{\mathcal{E}_{rms}}{Z} = \dfrac{120}{12.1}$, $\cos\phi = \underline{\dfrac{R}{Z}}$

#61 $N_P = 500$,
      $N_S = 10$.

$V_S = V_P \cdot \dfrac{N_S}{N_P}$

a. $V_S = 120 \times \dfrac{10}{500}$

   $= 20.24K$

   $= 2.4 V$

b. $I_P = \dfrac{V_P}{R_{eq}} = \dfrac{120}{\left(\dfrac{N_P}{N_S}\right)^2 R}$

   $= \dfrac{120}{2500 \times 15}$

   $= 3.2 \, mA$

b. $I_S = \dfrac{V_S}{R} = \dfrac{2.4}{15}$

   $= 0.16 \, A$.