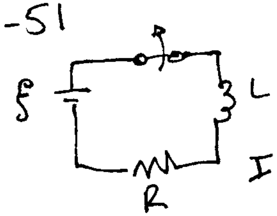
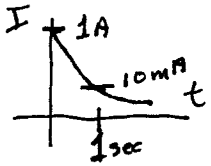
30-51



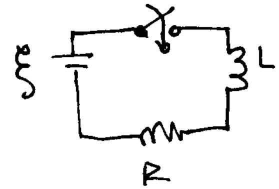
$L = 10$ Henry
$R = ?$



$$I(t) = I_0 e^{-t/\tau}$$
$$10\times10^{-3}\,A = 1A \quad e^{-1/\tau}$$
$$\tau = 0.217 \text{ sec}$$

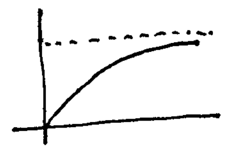
$$T = L/R = 0.217$$
$$\frac{10}{R} = 0.217$$
$$\rightarrow \quad R = 46.1\ \Omega$$

30-53



$\mathcal{E} = 14$ Volts
$L = 6.30\ \mu H$
$R = 1.20\ k\Omega$

$$\tau = L/R = \frac{6.30\times10^{-6}}{1.20\times10^{3}} = 5.25\times10^{-9} \text{ sec}$$



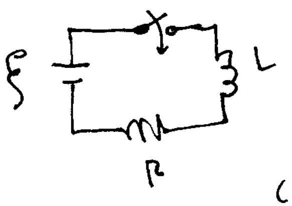
$$I_{max} = \mathcal{E}/R = \frac{14}{1.20\times10^{3}} = 0.0117 \text{ Amp}$$

$$I = I_{max}\left[1 - e^{-t/\tau}\right]$$

a) when is $I = 80\%$ of I_{max}?
$$0.80\, I_{max} = I_{max}\left[1 - e^{-t/\tau}\right]$$
$$\frac{t}{\tau} = 1.61$$
$$t = 1.61\,\tau = 1.61\,(5.25\times10^{-9}) = 8.45\times10^{-9} \text{ sec}$$

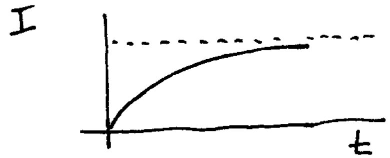
b) what is current when $t = \tau$
$$I = I_{max}\left[1 - e^{-t/\tau}\right]$$
$$= I_{max}\left[1 - e^{-1}\right]$$
$$= I_{max}\left[0.632\right] = (0.0117)\left[0.632\right]$$
$$= 7.40\times10^{-3} \text{ Amp.}$$

30-61



$\mathcal{E} = 50$ Volts
$R = 10\ k\Omega$
$L = ?$

Current is 2mA after 5 ms



$I_{max} = \frac{\mathcal{E}}{R} = \frac{50}{10\times10^3} = 5\times10^{-3}$ Amp.

$$I(t) = I_{max}\left[1 - e^{-t/\tau}\right]$$

a) $2\times10^{-3} = 5\times10^{-3}\left[1 - e^{-t/\tau}\right]$

$$\frac{t}{\tau} = 0.510$$

$$\frac{5\times10^{-3}}{\tau} = 0.510 \longrightarrow \tau = 9.79\times10^{-3}\ \text{sec}$$

so

$$\tau = L/R$$

$$9.79\times10^{-3} = L/10\times10^3$$

$$L = 97.9\ \text{H}.$$

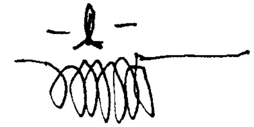
b) Energy Stored in Inductor

$$U = \frac{1}{2} L I^2$$

$$= \frac{1}{2}(97.9)(2\times10^{-3})^2$$

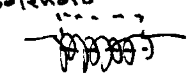
$$= 1.96\times10^{-4}\ \text{Joules}$$

30-67



$\ell = 0.85$m
$A = 17\ cm^2 = 17\times10^{-4}\ m^2$
$N = 950$ turns
$I = 6.6$ Amp

For a solenoid



$$\oint \vec{B}\cdot d\vec{s} = \mu_0 I_{thru}$$

$$B\cdot L = \mu_0 N I$$

$$B = \mu_0 \frac{N}{L} I$$

$$B = (4\pi\times10^{-7})\frac{950}{0.85}(6.6)$$

$$B = 9.26\times10^{-3}\ \text{Tesla}$$

a) Energy density

$$\frac{1}{2}\frac{1}{\mu_0}B^2 = \frac{1}{2}\frac{1}{4\pi\times10^{-7}}(9.26\times10^{-3})^2$$

$$= 34.2\ \text{Joules/m}^3$$

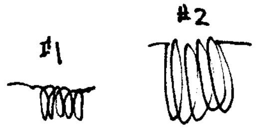
b) Total Energy Stored

$$\begin{pmatrix}\text{Energy}\\\text{density}\end{pmatrix}\left[\text{volume}\right]$$

$$(34.2)\left[(0.85)(17\times10^{-4})\right]$$

$$4.94\times10^{-2}\ \text{Joules}$$

30-72



$L_1 = 25\,mH$ $\quad$ $L_2 = 40\,mH$

$N_1 = 100$ $\quad$ $N_2 = 200$

$I = 6\,mA$

$\frac{dI}{dt} = 4\ A/s$

mutual inductance $M = 3\,mH$

a) Linking flux in coil #1

$$N_1\phi_B = L_1 I_1$$
$$100\,\phi_B = (25\times10^{-3})(6\times10^{-3})$$
$$\phi_B = 1.5\times10^{-6}\ \text{Weber}$$

b) Induced Emf in coil #1 from itself

$$\text{Ind Emf} = L_1 \frac{dI}{dt} = (25\times10^{-3})\,4$$
$$= 100\times10^{-3} = 0.1\ \text{Volt}$$

c) Flux in coil #2 from coil #1

$$N_2\phi_B = M I_1$$
$$200\,\phi_B = (3\times10^{-3})(6\times10^{-3})$$
$$\phi_B = 9\times10^{-8}\ \text{Weber}$$

d) Induced Emf in coil #2 from coil #1

$$\text{Ind Emf} = M\frac{dI_1}{dt} = (3\times10^{-3})(4)$$
$$= 12\times10^{-3}\ \text{Volts}$$

31-1

$L = 75\,mH$

$C = 3.6\,\mu F$

$Q_{max} = 2.90\,\mu Coul$

a) Total energy in circuit calculated from max energy in capacitor

$\frac{1}{2}CV^2$ or $\frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}\frac{(2.9\times10^{-6})^2}{3.6\times10^{-6}}$

$= 1.17\times10^{-6}$ Joules

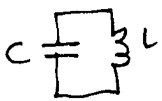
b) Max current occurs when all energy resides in inductor.

$\frac{1}{2}LI^2$

$1.17\times10^{-6} = \frac{1}{2}(75\times10^{-3})\,I^2$

$I = 5.58\times10^{-3}$ Amp

31-9



$L = 50\,mH$

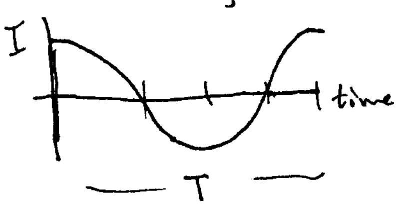
$C = 4\,\mu F$

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

$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{1}{LC}} = 3.56\times10^{2}$

$= 356\ Hz$

period $T = \frac{1}{f} = 2.81\times10^{-3}$ sec



All energy resides in capacitor when $I \to 0$

so this occurs when $\frac{1}{4}T = 7.02\times10^{-4}$ sec

31-10

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

$C = 6.7\,\mu F$

$f = 10\,kHz$

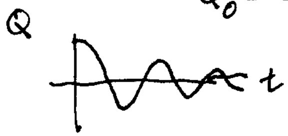
$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$

$10\times10^3 = \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$

$L = 3.78\times10^{-5}$ Henry

31-24

$R = 7.2\,\Omega$
$L = 10\ H$
$C = 3.2\,\mu F$
$Q_0 = 6.20\,\mu Coul$



$$Q = Q_0 e^{-\frac{1}{2}\frac{t}{\tau}} \cos(\omega' t + \overset{\to 0}{\phi})$$

$$\omega' = \sqrt{\omega^2 - \left(\frac{R}{2L}\right)^2} \quad \text{but assume } \omega' \approx \omega$$

Since we are asked about the charge on the capacitor N-complete cycles later, the $\cos(\omega' t + \phi) \Rightarrow 1$ always at that instant

Therefore we are only concerned about the amplitude of the oscillation

First find the period. $\omega = \sqrt{\frac{1}{LC}}$

$$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\frac{1}{\sqrt{LC}} = 28.15\ Hz$$

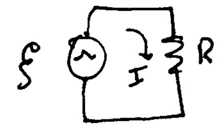
$$T = 0.0355\ sec$$

Now find the LR time constant

$$\tau = \frac{L}{R} = \frac{10}{7.2} = 1.39\ sec$$

N	t	$e^{-t/2\tau}$	$Q_0 e^{-t/\tau}$
5	5(0.0355)	0.938	5.81 μCoul
10	10(0.0355)	0.880	5.46 μCoul
100	100(0.0355)	0.278	1.73 μCoul

31-30

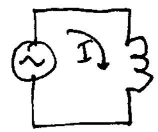


$\mathcal{E}_{max} = 30$ Volts
$R = 50$

In this ~~[illegible]~~ circuit, the max current doesn't depend on the oscillator frequency

$$I_{max} = \mathcal{E}_{max}/R = \frac{30}{50} = 0.6\ Amp$$

31-32

$\mathcal{E}$  $L = 12.7\ H$

$\mathcal{E} = \mathcal{E}_m \sin \omega t$

$\mathcal{E}_m = 25$ Volts

$\omega = 377$ rad/s

a) max current

$$I_{max} = \frac{\mathcal{E}_{max}}{X_L} \longrightarrow \frac{\mathcal{E}_{max}}{\omega L} = \frac{25}{(377)(12.7)}$$

$$= 5.22 \times 10^{-3} \text{ Amp}$$

b) When current maximum, what is $\mathcal{E}(t) = ?$

$I = I_{max} \cos(\omega t - 90^\circ)$ $\qquad$ $\mathcal{E}(t) = \mathcal{E}_{max} \sin \omega t$

The current is max when $\omega t = 90^\circ \longrightarrow \mathcal{E}(t) = \mathcal{E}_{max} \sin 90^\circ$

$= 0$ Volts

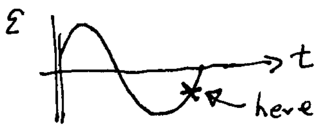
c) When generator is -12.5 Volts and increasing, what is current

$\mathcal{E}(t) = \mathcal{E}_{max} \sin \omega t$

$= 25 \sin \omega t$

$-12.5 = 25 \sin \omega t$

$\omega t = 330^\circ$

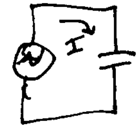


$\longrightarrow I = I_{max} \cos(\omega t - 90^\circ)$

$= (5.22 \times 10^{-3}) \cos(330^\circ - 90^\circ)$

$= -2.61 \times 10^{-3}$ Amp

31-34

$\mathcal{E}$  $C = 4.15\ mF$

$\mathcal{E} = \mathcal{E}_M \sin \omega t$

$\mathcal{E}_m = 25$ Volts

$\omega = 377$ rad/s

a) max current

$$I_{max} = \frac{\mathcal{E}_{max}}{X_L} \longrightarrow \frac{\mathcal{E}_{max}}{1/\omega C} = \omega C \mathcal{E}_{max}$$

$$= 3.91 \times 10^{-2} \text{ Amp}$$

b) When current is max, what is $\mathcal{E}(t) = ?$

$I = I_{max} \cos(\omega t + 90^\circ)$

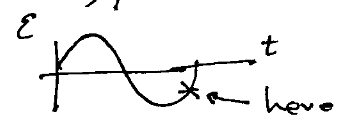
current max when $\omega t = -90^\circ \longrightarrow \mathcal{E}(t) = \mathcal{E}_{max} \sin(-90^\circ)$

$= 0$

c) When generator is -12.5 Volts and increasing, what is current?

$\mathcal{E}(t) = \mathcal{E}_{max} \sin \omega t$

$\omega t = 330^\circ$



$\longrightarrow I = I_{max} \cos(\omega t + 90^\circ)$

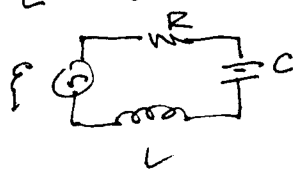
$= (3.91 \times 10^{-2}) \cos(330 + 90^\circ)$

$= 1.96 \times 10^{-2}$ Amp

31-41

$R = 200\ \Omega$
$C = 70\ \mu F$
$L = 230\ mH$

$f_d = 60\ Hz$ → $\omega = 2\pi f = 377\ rad/s$
$\mathcal{E}_m = 36\ V$



a) $Z^2 = R^2 + (X_L - X_c)^2$

$X_L = \omega L = 86.71$
$X_c = \frac{1}{\omega C} = 37.89$

$Z^2 = 200^2 + (86.71 - 37.89)^2$
$Z = 206\ \Omega$

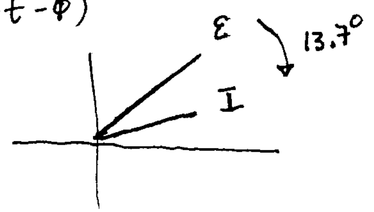
b) Phase $\tan\phi = \frac{X_L - X_c}{R} = \frac{86.71 - 37.89}{200} = 0.244$

$\phi = 13.7^\circ$

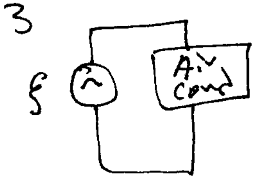
c) Current amplitude

$I = \frac{\mathcal{E}_{max}}{Z} = \frac{36}{206} = 0.175$ Amp

d) $\mathcal{E} = \mathcal{E}_{max} \sin \omega t$
$I = I_{max}(\omega t - \phi)$



31-53



$\mathcal{E}_{\cancel{max}\ rms} = 120$ Volts
$R = 12\ \Omega$
$X_L = 1.3\ \Omega$

a) Impedance
$Z^2 = R^2 + (X_L - X_c)^2 =$

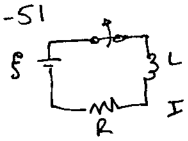
$Z = 12.07\ \Omega$

b) Power
$P_{AVE} = I_{rms} V_{rms}$
$= \frac{V_{rms}}{Z} V_{rms}$
$= \frac{120}{12.07}\ 120 = 1193$ Watts

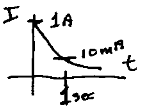
31-54 If $V_{rms} = 100$ Volts

$V_{rms} = \frac{1}{\sqrt{2}} V_{max}$
$100 = \frac{1}{\sqrt{2}} V_{max}$
$V_{max} = 144$ Volts

30-51



$L = 10$ Henry
$R = ?$



$I(t) = I_0 e^{-t/\tau}$

$10\times10^{-3}\,A = 1A \quad e^{-1/\tau}$

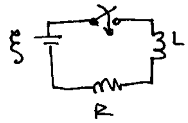
$\tau = 0.217$ sec

$\tau = L/R = 0.217$

$\frac{10}{R} = 0.217$

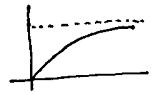
$\rightarrow R = 46.1\ \Omega$

30-53



$\xi = 14$ Volts
$L = 6.30\,\mu H$
$R = 1.20\ k\Omega$

$\tau = L/R = \frac{6.30\times10^{-6}}{1.20\times10^{3}} = 5.25\times10^{-9}$ sec



$I_{max} = \xi/R = \frac{14}{1.20\times10^{3}} = 0.0117$ Amp

$I = I_{max}\left[1 - e^{-t/\tau}\right]$

a) when is $I = 80\%$ of I_{max}?

$0.80\, I_{max} = I_{max}\left[1 - e^{-t/\tau}\right]$

$\frac{t}{\tau} = 1.61$

$t = 1.61\tau = 1.61\,(5.25\times10^{-9}) = 8.45\times10^{-9}$ sec

b) what is current when $t = \tau$

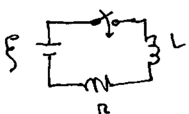
$I = I_{max}\left[1 - e^{-t/\tau}\right]$

$= I_{max}\left[1 - e^{-1}\right]$

$= I_{max}\left[0.632\right] = (0.0117)\left[0.632\right]$

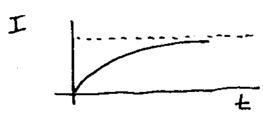
$= 7.40\times10^{-3}$ Amp.

30-61



$\xi = 50$ Volts
$R = 10\ k\Omega$
$L = ?$

Current is 2mA after 5 ms



$I_{max} = \frac{\xi}{R} = \frac{50}{10\times10^{3}} = 5\times10^{-3}$ Amp.

$I(t) = I_{max}\left[1 - e^{-t/\tau}\right]$

a) $2\times10^{-3} = 5\times10^{-3}\left[1 - e^{-t/\tau}\right]$

$\frac{t}{\tau} = 0.510$

$\frac{5\times10^{-3}}{\tau} = 0.510 \longrightarrow \tau = 9.79\times10^{-3}$ sec

so

$\tau = L/R$

$9.79\times10^{-3} = \frac{L}{10\times10^{3}}$

$L = 97.9$ H.

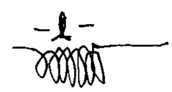
b) Energy Stored in Inductor

$U = \frac{1}{2} L I^2$

$= \frac{1}{2}(97.9)(2\times10^{-3})^2$

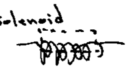
$= 1.96\times10^{-4}$ Joules

30-67



$l = 0.85$ m
$A = 17\ cm^2 = 17\times10^{-4}\ m^2$
$N = 950$ turns
$I = 6.6$ Amp

For a solenoid



$\oint \vec{B}\cdot d\vec{s} = \mu_0 I_{thru}$

$B\cdot L = \mu_0 N I$

$B = \mu_0 \frac{N}{L} I$

$B = (4\pi\times10^{-7})\frac{950}{0.85}(6.6)$

$B = 9.26\times10^{-3}$ Tesla

a) Energy density

$\frac{1}{2}\frac{1}{\mu_0}B^2 = \frac{1}{2}\frac{1}{4\pi\times10^{-7}}(9.26\times10^{-3})^2$

$= 34.2$ Joules/m^3

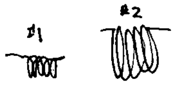
b) Total Energy Stored

(Energy density) [volume]

$(34.2)\left[(0.85)(17\times10^{-4})\right]$

4.94×10^{-2} Joules

30-72



$L_1 = 25\,mH$ $\quad L_2 = 40\,mH$

$N_1 = 100$ $\quad N_2 = 200$

$I = 6\,mA$

$\frac{dI}{dt} = 4\ A/s$

mutual inductance $M = 3\,mH$

a) Linking flux in coil #1

$$N_1\phi_B = L_1 I_1$$
$$100\,\phi_B = (25\times10^{-3})(6\times10^{-3})$$
$$\phi_B = 1.5\times10^{-6}\ \text{Weber}$$

b) Induced Emf in coil #1 from itself

$$\text{Ind Emf} = L_1\frac{dI}{dt} = (25\times10^{-3})\,4$$
$$= 100\times10^{-3} = 0.1\ \text{Volt}$$

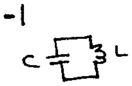
c) Flux in coil #2 from coil #1

$$N_2\phi_B = M I_1$$
$$200\,\phi_B = (3\times10^{-3})(6\times10^{-3})$$
$$\phi_B = 9\times10^{-8}\ \text{Weber}$$

d) Induced Emf in coil #2 from coil #1

$$\text{Ind Emf} = M\frac{dI_1}{dt} = (3\times10^{-3})(4)$$
$$= 12\times10^{-3}\ \text{Volts}$$

31-1



$L = 75\,mH$

$C = 3.6\,\mu F$

$Q_{max} = 2.90\,\mu Coul$

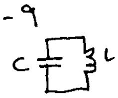
a) Total energy in circuit calculated from max energy in capacitor

$$\tfrac{1}{2}CV^2 \text{ or } \tfrac{1}{2}\frac{Q^2}{C} = \tfrac{1}{2}\frac{(2.9\times10^{-6})^2}{3.6\times10^{-6}}$$
$$= 1.17\times10^{-6}\ \text{Joules}$$

b) Max current occurs when all energy resides in inductor.

$$\tfrac{1}{2}LI^2$$
$$1.17\times10^{-6} = \tfrac{1}{2}(75\times10^{-3})\,I^2$$
$$I = 5.58\times10^{-3}\ \text{Amp}$$

31-9

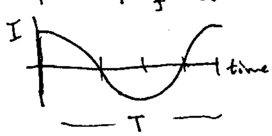


$L = 50\,mH$

$C = 4\,\mu F$

$$\omega = \sqrt{\frac{1}{LC}}$$
$$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{1}{LC}} = \frac{1}{2\pi}\,3.56\times10^{2}$$
$$= 356\ \text{Hz}$$

period $T = \frac{1}{f} = 2.81\times10^{-3}$ sec



All energy resides in capacitor when $I \to 0$

so this occurs when $\frac{1}{4}T = 7.02\times10^{-4}$ sec

31-10

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

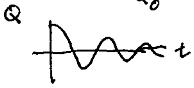
$C = 6.7\,\mu F$

$f = 10\,kHz$

$$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$$
$$10\times10^{3} = \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$$
$$L = 3.78\times10^{-5}\ \text{Henry}$$

31-24

$R = 7.2\,\Omega$
$L = 10$ H
$C = 3.2\,\mu F$
$Q_0 = 6.20\,\mu Coul$



$$Q = Q_0 e^{-\frac{1}{2}\frac{t}{\tau}} \cos(\omega' t + \overset{0}{\phi})$$

$$\omega' = \sqrt{\omega^2 - \left(\frac{R}{2L}\right)^2} \text{ but assume } \omega' \approx \omega$$

Since we are asked about the charge on the capacitor N-complete cycles later, the $\cos(\omega' t + \phi) \Rightarrow 1$ always at that instant
Therefore we are only concerned about the amplitude of the oscillation

First find the period $\cdot\ \omega = \sqrt{\frac{1}{LC}}$

$$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\frac{1}{\sqrt{LC}} = 28.15 \text{ Hz}$$

$$T = 0.0355 \text{ sec}$$

Now find the LR time constant

$$\tau = \frac{L}{R} = \frac{10}{7.2} = 1.39 \text{ sec}$$

N	t	$e^{-t/2\tau}$	$Q_0 e^{-t/\tau}$
5	5(0.0355)	0.938	5.81 μCoul
10	10(0.0355)	0.880	5.46 μCoul
100	100(0.0355)	0.278	1.73 μCoul

31-30

$\xi_{max} = 30$ Volts
$R = 50$

In this ~~charge~~ circuit, the max current doesn't depend on the oscillator ~~freq~~uency

$$I_{max} = \mathcal{E}_{max}/R = \frac{30}{50} = 0.6 \text{ Amp}$$

31-32

$\xi = \mathcal{E}_m \sin\omega t$
$\mathcal{E}_m = 25$ Volts
$\omega = 377$ rad/s

a) max current

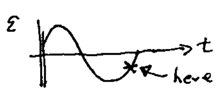
$$I_{max} = \frac{\mathcal{E}_{max}}{X_L} \longrightarrow \frac{\mathcal{E}_{max}}{\omega L} = \frac{25}{(377)(12.7)} = 5.22\times10^{-3} \text{ Amp}$$

b) When current maximum, what is $\mathcal{E}(t)$ = ?

$I = I_{max}\cos(\omega t - 90^\circ)$ $\quad \mathcal{E}(t) = \mathcal{E}_{max}\sin\omega t$

the current is max when $\omega t = 90^\circ \longrightarrow \mathcal{E}(t) = \mathcal{E}_{max} \sin 90^\circ$
$= 0$ Volts

c) When generator is -12.5 Volts and increasing, what is current



$\mathcal{E}(t) = \mathcal{E}_{max}\sin\omega t$
$= 25\sin\omega t$
$-12.5 = 25\sin\omega t$
$\omega t = 330^\circ$

$$\longrightarrow I = I_{max}\cos(\omega t - 90^\circ)$$
$$= (5.22\times10^{-3})\cos(330^\circ - 90^\circ)$$
$$= -2.61\times10^{-3} \text{ Amp}$$

31-34

$\mathcal{E} = \mathcal{E}_M \sin\omega t$
$\mathcal{E}_m = 25$ Volts
$\omega = 377$ rad/s

a) max current

$$I_{max} = \frac{\mathcal{E}_{max}}{X_L} \longrightarrow \frac{\mathcal{E}_{max}}{1/\omega C} = \omega C\,\mathcal{E}_{max}$$
$$= 3.91\times10^{-2} \text{ Amp}$$

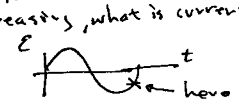
b) When current is max, what is $\mathcal{E}(t)$ = ?

$I = I_{max}\cos(\omega t + 90^\circ)$

current max when $\omega t = -90^\circ \longrightarrow \mathcal{E}(t) = \mathcal{E}_{max}\sin(-90^\circ)$
$= 0$

c) When generator is -12.5 Volts and increasing, what is current?

$\mathcal{E}(t) = \mathcal{E}_{max}\sin\omega t$
$\omega t = 330^\circ$



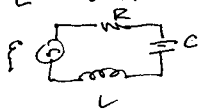
$$\longrightarrow I = I_{max}\cos(\omega t + 90^\circ)$$
$$= (3.91\times10^{-2})\cos(330 + 90^\circ)$$
$$= 1.96\times10^{-2} \text{ Amp}$$

31-41

$R = 200\ \Omega$
$C = 70\ \mu F$
$L = 230\ mH$

$f_d = 60\ Hz$
$\mathcal{E}_m = 36\ V$

$\omega = 2\pi f = 377\ rad/s$



a) $Z^2 = R^2 + (X_L - X_C)^2$

$X_L = \omega L = 86.71$
$X_C = \frac{1}{\omega C} = 37.89$

$Z^2 = 200^2 + (86.71 - 37.89)^2$

$Z = 206\ \Omega$

b) Phase $\tan\phi = \frac{X_L - X_C}{R} = \frac{86.71 - 37.89}{200} = 0.244$

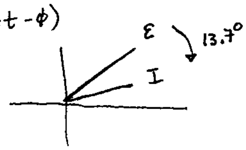
$\phi = 13.7^\circ$

c) Current amplitude

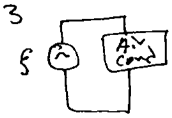
$I = \frac{\mathcal{E}_{max}}{Z} = \frac{36}{206} = 0.175$ Amp

d) $\mathcal{E} = \mathcal{E}_{max} \sin \omega t$

$I = I_{max}(\omega t - \phi)$



31-53



$\mathcal{E}_{\cancel{max}\ rms} = 120$ Volts
$R = 12\ \Omega$
$X_L = 1.3\ \Omega$

a) Impedance

$Z^2 = R^2 + (X_L - \underbrace{X_C}_{0})^2 =$

$Z = 12.07\ \Omega$

b) Power

$P_{AVE} = I_{rms} V_{rms}$
$= \frac{V_{rms}}{Z} V_{rms}$
$= \frac{120}{12.07}\ 120 = 1193$ Watts

31-54 If $V_{rms} = 100$ Volts

$V_{rms} = \frac{1}{\sqrt{2}} V_{max}$
$100 = \frac{1}{\sqrt{2}} V_{max}$
$V_{max} = 144$ Volts