Ch. 30 #14

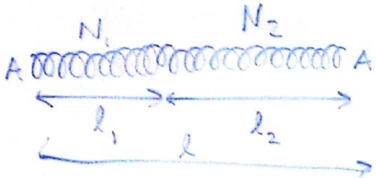
$Z_1 = i\omega L_1$ $\quad$ $Z_2 = i\omega L_2$

series 

equiv. to 

$Z = Z_1 + Z_2 = i\omega L$

$L = L_1 + L_2$



$n = \frac{N}{l} = \frac{N_1}{l_1} = \frac{N_2}{l_2}$

$N = N_1 + N_2$

$l = l_1 + l_2$

$$L = \frac{\mu_0 N^2 A}{l} = \mu_0 N n A = \mu_0 (N_1 + N_2) n A = \mu_0 N_1 n_1 A + \mu_0 N_2 n_2 A = L_1 + L_2$$

$Z_1 = \frac{1}{i\omega C_1}$ $\quad$ $Z_2 = \frac{1}{i\omega C_2}$

$C = (C_1^{-1} + C_2^{-1})^{-1}$

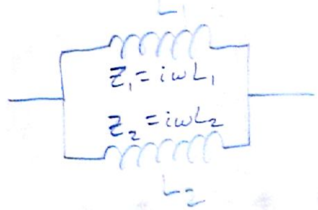
$\frac{1}{i\omega C} = Z = Z_1 + Z_2$

 $\approx$ 

$Z_1 = R_1$ $\quad$ $Z_2 = R_2$ $\quad$ $Z = R$

$R = R_1 + R_2$

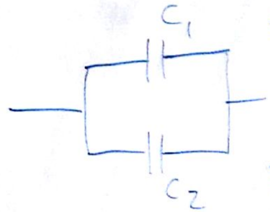
$Z = Z_1 + Z_2$



$Z = (Z_1^{-1} + Z_2^{-1})^{-1} = i\omega L$

equiv to 

$L = (L_1^{-1} + L_2^{-1})^{-1}$



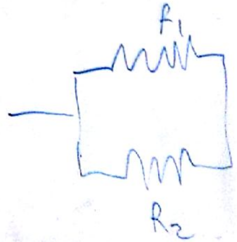
$Z_1 = \frac{1}{i\omega C_1}$

$Z_2 = \frac{1}{i\omega C_2}$

$Z = (Z_1^{-1} + Z_2^{-1})^{-1} = \frac{1}{i\omega C}$

equiv to 

$C = C_1 + C_2$



$Z_1 = R_1$

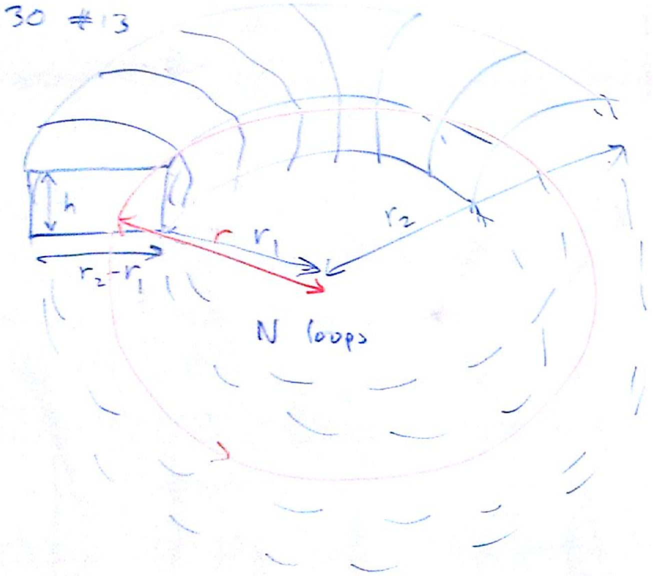
$Z_2 = R_2$

$Z = (Z_1^{-1} + Z_2^{-1})^{-1}$

$\parallel$

$R = (R_1^{-1} + R_2^{-1})^{-1}$

Ch. 30 #13



Show that

$$L = \frac{\mu_0 N^2 h}{2\pi} \ln \frac{r_2}{r_1} = \checkmark$$

B=?

Faraday

Ampere

Gauss

Gauss for Magnetism

Definition:

$$L = \frac{N\Phi_B}{I} = \frac{N}{I}\left(\frac{hNI\mu_0}{2\pi}\ln\frac{r_2}{r_1}\right)$$

Φ_B = magnetic flux per loop

$$\underset{\text{Faraday}}{\mathcal{E} = -N\frac{d\Phi_B}{dt}} = -L\frac{dI}{dt}$$

Ampere's Law: $\oint \vec{B}\cdot d\vec{l} = (I_{encl})\mu_0$

Loop of radius r: $2\pi r B = NI\mu_0$

$$B = \frac{NI\mu_0}{2\pi r}$$

$$\Phi_B = \underset{\text{rectangle}}{\iint} \vec{B}\cdot d\vec{A} = h\int_{r=r_1}^{r=r_2} \frac{NI\mu_0}{2\pi}\frac{dr}{r} = \frac{hNI\mu_0}{2\pi}\ln\frac{r_2}{r_1}$$