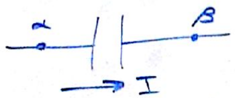
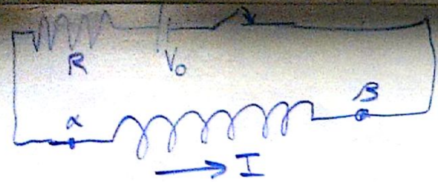
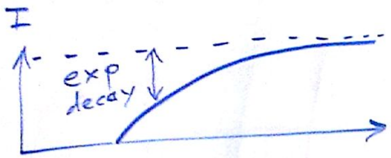
Appendix E: optional supplement to Ch. 31

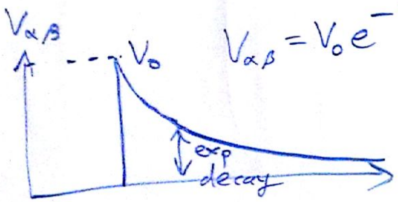
	impedance for ac circuit	voltage response to current	stored energy	energy density	$P=VI$ power	τ time for e^{-1} factor of decay of voltage & current
Inductor	$Z=\omega L$ complex $Z=i\omega L$	 $V=L\frac{dI}{dt}$	$U=\frac{1}{2}LI^2$	$u=\frac{\mu}{2}B^2$ $\mu=K_m\mu_0$ $u=\frac{\mu_0}{2}B^2$ in absence of ferromagnetic stuff	$LI\frac{dI}{dt}$	$\tau=\frac{L}{R}$
Capacitor	$Z=\frac{1}{\omega C}$ complex $Z=\frac{1}{i\omega C}$	 $V_{\alpha\beta}=\frac{1}{C}\left(Q_0+\int_0^t I\,dt\right)$	$U=\frac{1}{2}CV^2$	$u=\frac{1}{2}\underbrace{K\epsilon_0}_{\epsilon}E^2$ $u=\frac{1}{2}\epsilon_0E^2$ in absence of dielectric material	$CV\frac{dV}{dt}$	$\tau=RC$





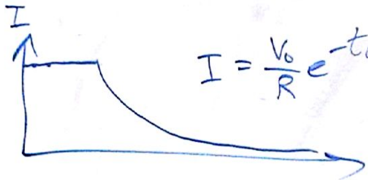
$I_\infty = \frac{V_0}{R}$

$I = \frac{V_0}{R}\left(1 - e^{-t/\tau}\right)$

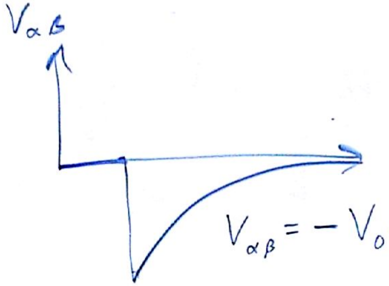


$V_{\alpha\beta} = V_0 e^{-t/\tau}$

take away battery:



$I = \frac{V_0}{R} e^{-t/\tau}$



$V_{\alpha\beta} = -V_0 e^{-t/\tau}$

fourier transform

$$f(t) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \hat{f}(\omega)\, e^{i\omega t}\, dt$$

$$\widehat{\int f(t)\, dt} = \frac{\hat{f}(\omega)}{i\omega}$$

$$\widehat{f'(t)} = i\,\hat{f}(\omega)\,\omega$$