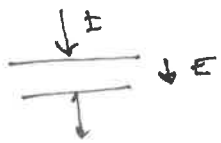
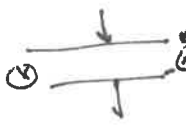
Phys 341 – class 37 – ch16.pdf #1

#1 a) $Q = It$; $E = \frac{\sigma}{\varepsilon_0} = \frac{Q}{A\varepsilon_0} = \frac{I}{A\varepsilon_0} t$ (A = area)



b) $\vec{J}_D = \varepsilon_0 \partial_t \vec{E} = \frac{I}{A}$ ← same current just spread over $A = \pi a^2$

c) $E = \frac{I}{A\varepsilon_0} t$



$B = \frac{\mu_0 I}{2\pi a}$; $H = \frac{I}{2\pi a}$

$\vec{S} = \vec{E} \times \vec{H} = \frac{I}{\pi\varepsilon_0} t \frac{I}{2\pi a}$ ⊙ into cap by rhr

d) total power entering cap: $S \cdot 2\pi a d$ (edge area)

$= \frac{I^2 t}{A\varepsilon_0} d$

energy between plates $= \frac{1}{2} E \cdot D \cdot \pi a^2 d$ (volume between plates)

$= \left(\frac{I}{A\varepsilon_0} t\right)\left(\frac{I}{A} t\right) \frac{1}{2} \pi a^2 d$

$\frac{d}{dt}$ of stored energy $= \frac{I^2}{A^2\varepsilon_0} t \, \pi a^2 d$ ($\pi a^2 = A$)

$= \frac{I^2 t}{A\varepsilon_0} d$ ← same as above