10.1 (1) $\vec{J_D} = \frac{\partial \vec{D}}{\partial t}$

$I_1 = S\cdot\frac{\partial D}{\partial t} = \varepsilon S\frac{\partial E}{\partial t} = \frac{\varepsilon S}{d}\frac{\partial U}{\partial t} = C\frac{\partial U}{\partial t} = 2\times10^{-6}\times1\times10^{3} = 2\times10^{-3}\,A$.

(2). $I = \frac{dU}{dt}\cdot\frac{t}{R}$.

$t = \frac{IR}{dU/dt} = \frac{2\times10^{-3}A\times5\times10^{5}\Omega}{1\times10^{3}V\cdot s^{-1}} = 1s$.

(3).

$2\pi r\cdot B = \mu_0(I+I_1)\times\frac{\pi r^2}{\pi R^2}$

$B = \frac{\mu_0 r\left(\frac{dU}{dt}\cdot t/R_0 + C\frac{dU}{dt}\right)}{2\pi R^2}$.

$t=0$: $B = \frac{4\pi\times10^{-7}\times0.2\times2\times10^{-3}}{2\pi\times0.3\times0.3} = 8.9\times10^{-10}\,T$

$t=1$: $B = \frac{4\pi\times10^{-7}\times0.2\left(1\times10^{3}\times1/5\times10^{5}+2\times10^{-3}\right)}{2\pi\times0.3\times0.3} = 1.8\times10^{-9}\,T$

$t=2$: $B = \frac{4\pi\times10^{-7}\times0.2\left(2\times10^{3}/5\times10^{5}+2\times10^{-3}\right)}{2\pi\times0.3\times0.3} = 2.7\times10^{-9}\,T$.

10.4. 边界条件：

$\begin{cases}\varepsilon_1 E_1\sin\theta_1 = \varepsilon_2 E_2\sin\theta_2\\ \varepsilon E_1\cos\theta_1 = \varepsilon_2 E_2\cos\theta_2\end{cases}\Rightarrow \varepsilon_1\cot\theta_1 = \varepsilon_2\cot\theta_2$.

$\begin{cases}\mu_1 H_1\cos\varphi_1 = \mu_2 H_2\cos\varphi_2\\ H_1\sin\varphi_1 = H_2\sin\varphi_2\end{cases}\rightarrow \mu_1\cot\varphi_1 = \mu_2\cot\varphi_2$.

10.6. (1). $\varepsilon E^2 = \mu H^2 \rightarrow H = \sqrt{\frac{\varepsilon}{\mu}}E = \sqrt{\frac{8.85\times10^{-12}}{4\pi\times10^{-7}}}\cdot15\times10^{-3} = 3.98\times10^{-5}\,A/m$.

(2). $k = \frac{\omega}{v} = \frac{2\pi f}{c} = 1.66\,rad/m$.

(3). $\lambda = VT = \frac{c}{f} = 5.78\,m$.

(4) $P = \varepsilon\left(\frac{dE}{dt}\right)^2 dV = \frac{1}{2}\varepsilon E^2\cdot\frac{c\,dt\cdot4\pi r^2}{dt}$

$= 2\pi r^2\varepsilon E^2 c = 3.75\times10^{4}\,W$

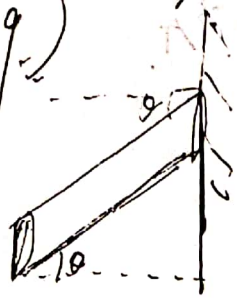
10.8 由 $\bar{S}\cdot 4\pi r^2 = \bar{S}_1 \cdot 4\pi R^2$

$\bar{S}_1 = \frac{r^2}{R^2}\bar{S} = \frac{(1.5\times10^{11})^2}{(7\times10^8)^2}\cdot 1353 \approx 6.2\times10^7\ W/m^2$.

(2). $\bar{S}_1 = \varepsilon E^2 \cdot c \rightarrow E = \sqrt{\frac{\bar{S}_1}{\varepsilon c}} \approx 1.5\times10^5\ V/m$

(3). $H = \sqrt{\frac{\varepsilon}{\mu}}E \approx 4\times10^2\ A/m$.

10.9



N). $S = \frac{n\cdot h\nu\cdot c\cdot dt\cdot A}{A\cdot dt}$.

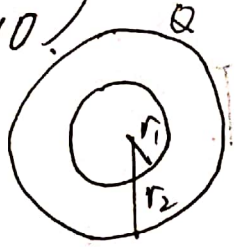
压强 $P = \frac{n\frac{2h}{\lambda}\cdot\cos\theta\cdot c\cos\theta\cdot dt\cdot A}{dt\cdot A} = 2nh\nu\, c\cos^2\theta = \frac{2S\cos^2\theta}{c}$

(2). $P = n\left(\frac{h}{\lambda}\cdot\cos\theta(1-\alpha) + \frac{h}{\lambda}\cos\theta\right)\cdot c\cos\theta\, dt\cdot A$

$dt\cdot A$.

$= \frac{(2-\alpha)S\cos^2\theta}{c}$.

10.10



$L = I\omega$ $\quad \vec{D} = \frac{Q}{4\pi r^2}\cdot\vec{e_r}$.

$\vec{L} = \vec{r}\times\vec{q} = \vec{r}\times(\vec{D}\times\vec{B}) = \rho\frac{QB}{4\pi r}\sin^2\theta\cdot\hat{z}$.

$L = \iiint l_z\cdot dV = \iiint \frac{QB}{4\pi r}\sin^2\theta\, d\theta\, d\varphi\, r^2 dr = \frac{QB}{8\pi}(r_2^2 - r_1^2)\cdot 2\pi\times\left(\frac{4\pi}{3}\right)$.

$= \frac{QB}{3}(r_1^2 - r_2^2)$.

$\omega = \frac{L}{I} = \frac{QB}{3I}(r_2^2 - r_1^2)$. 方向与原磁场反向.