期末样题

2022年6月29日 星期三 下午4:29

1. 安培环路定理.
2. 顺磁质. 铁磁质.
3. 大
4. $9.28\times10^{-24}\ A\cdot m^2$ $12.5\ T$

$\mu=\frac{mv^2}{2B}=IS=\frac{q}{T}\pi R^2=\frac{qv}{2\pi R}\pi R^2=\frac{qvR}{2}$

$T=\frac{2\pi}{\omega}$. $\omega=\frac{2\pi}{T}$. $v=\omega r$ $=\frac{1.6\times10^{-19}\times2.19\times10^6\times0.5\times10^{-10}}{2}$

$I=\frac{Q}{T}=\frac{ev}{2\pi r}$. $B=\int_0^{2\pi}\frac{\mu_0}{4\pi}\frac{Ir d\theta}{r^2}=\frac{\mu_0 I}{2r}$

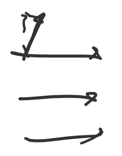
$=\frac{\mu_0}{2r}\times\frac{ev}{2\pi r}=\frac{\mu_0 ev}{4\pi r^2}$

5. $7.107\times10^{-3}m$ $7.730\times10^{-2}m$.

$evB=m\frac{v_\perp^2}{R}$. $R=\frac{mv_\perp}{eB}=\frac{m\frac{1}{2}v}{eB}$

$T=\frac{2\pi R}{v_\perp}=\frac{2m v_\perp}{v_\perp eB}=\frac{2\pi m}{qB}$

$h=v_\parallel T=\frac{\sqrt{3}v2\pi m}{eB}$

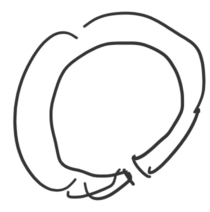


6. ____. 1.26×10^{-20}

$I=neSv$ $v=\frac{I}{neS}=\frac{J}{ne}$

$evB=\frac{U}{d}e$, $U=Bvd=\frac{BJ}{ne}=\frac{10^{-1}\times10\times10^3}{4.4\times10^{?}\times\ldots}$

7. $\frac{\mu_r\mu_0NI}{L}$ $\frac{\mu_r\mu_0NI}{\mu_r d+L-d}$.



$H\times L=NI$, $B=\frac{\mu_0 NI}{L}$.

$B\times\frac{L-d}{\mu_r\mu_0}+B\times\frac{d}{\mu_0}=NI$.

$B=\frac{\mu_r\mu_0NI}{\mu_r d+L-d}$.

8. 480W 0.6 电感.

$\tan\varphi=\frac{\omega L-\frac{1}{\omega C}}{R}=\frac{1000\times10\times10^{-3}-\frac{1}{10^3\times2\ldots}}{30}$ $\omega=1000$

$\cos\varphi=\frac{3}{5}$. $\frac{V^2}{Z}$. $Z=\sqrt{R^2+(\omega L)^2-(\frac{1}{\omega C})^2}$

$\frac{200^2}{50}\times\frac{3}{5}=\frac{800\ldots}{50}\times\frac{3}{5}$ $=\sqrt{30^2+(10^2-\ldots)}=50$

$\frac{1}{\omega C}>\omega L$.

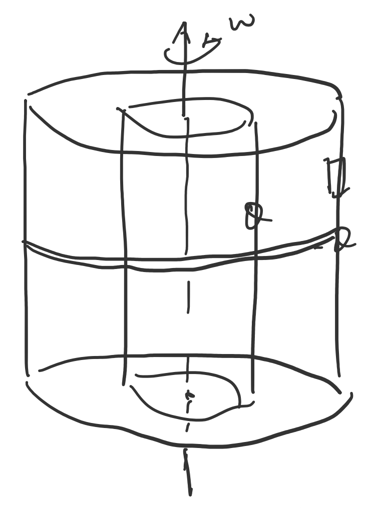
9. $4.67\times10^{-4}Pa$.

$S=10^5$. $(\frac{S_A}{C}+\frac{S_C}{C})A\cdot\Delta t=F\Delta t=pA\Delta t$

$p=\frac{S_A}{C}+\frac{S_C}{C}=1.4\frac{S}{C}$

$1.4\times\frac{10^5}{3\times10^8}=1.4\times\frac{1}{3\times10^3}$

1.

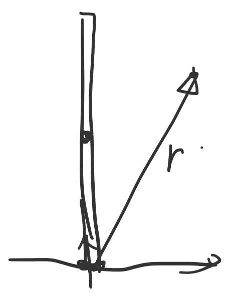


$dQ_1=\sigma dS=\frac{-Q}{2\pi bh}bd\theta dl=-\frac{Q}{2\pi h}d\theta dl$

$dI_1=\frac{dQ_1}{T}=\frac{dQ_1}{\frac{2\pi}{\omega}}=\frac{\omega Q}{2\pi\cdot2\pi h}d\theta dl$

$dm_1=IS=\frac{\omega Q}{2\pi h}dl\times\pi b^2=\frac{\omega Q b^2}{2h}dl$

$d\vec{B}_1=-\frac{\mu_0\vec{m}}{4\pi r^3}+\frac{\mu_0\vec{r}(\vec{m}\cdot\vec{r})}{4\pi r^5}$



$d\vec{F}_B=dQ_1\vec{v}\times\vec{B}=-\frac{Q}{2\pi bh}dS\,\omega b\vec{e}_\theta\times(-\frac{Q\mu_0\omega}{2\pi h})\vec{e}_\theta$

$=\frac{Q^2\mu_0\omega^2}{4\pi^2 bh^2}\vec{e}_\theta\,dS$. ✗

$\vec{E}=\frac{\ldots Q}{2\pi\varepsilon_0 bI}=\frac{\varepsilon_0 Q}{2\pi bh}\cdot d\vec{F}_e=\frac{\varepsilon_0 Q}{2\pi bh}\times\frac{Q}{2\pi h}=\frac{\varepsilon_0 Q^2}{4\pi^2 h^2}$ ✗

$w=\frac{1}{2\mu_0}B^2=\frac{1}{2\mu_0}\times(-\frac{\mu_0 Q\omega}{2\pi h})^2=\frac{\mu_0 Q^2\omega^2}{8\pi^2h^2}$

$W=\iiint\frac{\mu_0 Q^2\omega}{8\pi^2h^2}dV=\int_0^{2\pi}\int_b^a\int_0^h\frac{\mu_0 Q^2\omega}{8\pi^2h^2}r\ dl\,d\theta\,dr=\frac{\mu_0 Q^2\omega}{8\pi h}(b^2-a^2)$

$\sigma_1=\frac{Q}{2\pi ah}$. $\sigma_2=-\frac{Q}{2\pi bh}$.

$i_1=\frac{Q\omega}{2\pi h}$ $i_2=-\frac{Q\omega}{2\pi h}$

吸收 $\times2$. 从 z 上 上方内部产生B.

$r<a$, $\vec{B}=\vec{B}_1+\vec{B}_2=(\mu_0 i_1+\mu_0 i_2)=0$.

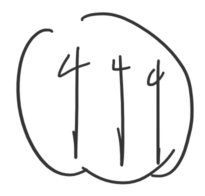
$a<r<b$, $\vec{B}=\vec{B}_1+\vec{B}_2=-\frac{\mu_0 Q\omega}{2\pi h}\vec{e}_z$.

$r>b$, $\vec{B}=0$

$f_{B1}=\sigma\vec{v}\times(\frac{\vec{B}_2+\vec{B}_3}{2})=\frac{1}{2}\ldots$

$f_{\bar{D}B}=\frac{1}{2}(E_2+E_3)\sigma=\frac{1}{2}\ldots$

2.



$\vec{B}=-\frac{\mu_0\vec{m}}{4\pi r^3}+\frac{\mu_0\vec{r}(\vec{m}\cdot\vec{r})}{4\pi r^5}$. 外部.

$m=\frac{\sum\vec{m}}{V}$

$i=\vec{n}\times\vec{M}=M\sin\theta\,\vec{e}_\varphi$.

$dI=M\sin\theta R d\theta$.

$dB=\frac{\mu_0}{2}\frac{r^2dI}{(z^2+r^2)^{3/2}}$. $B=\frac{2}{3}\mu M$.

3.

(1) $E=\frac{U}{h}=\frac{U}{h_0+vt}$.

$j_d=\varepsilon_0\frac{\partial E}{\partial t}=-\varepsilon_0\frac{Uv}{(h_0+vt)^2}$

$I_d=-\frac{\varepsilon_0 Uv\pi R^2}{(h_0+vt)^2}$.

$B\times2\pi r=\mu_0 j_d\pi r^2$

$B=-\frac{r}{2}\times\frac{\varepsilon_0 Uv}{(h_0+vt)^2}=-\frac{\mu_0 r\varepsilon_0 Uv}{2(h_0+vt)^2}\vec{e}_\theta$

$\vec{S}=\frac{1}{\mu_0}\vec{E}\times\vec{B}=\frac{r\varepsilon_0U^2v}{2(h_0+vt)^3}\vec{e}_r$. ✓

(2). $\frac{\partial W}{\partial t}=\vec{S}\times2\pi Rh(t)=\frac{\varepsilon_0 U^2v\pi R^2}{(h_0+vt)^2}$

传导电流 $I=\frac{dQ}{dt}=\frac{d(CU)}{dt}=-U\varepsilon_0\pi R^2\frac{v}{(h_0+vt)^2}$

$P=-UI=\ldots$