Università degli Studi Roma Tre
Dipartimento di Matematica

Appello A
FS2, Fisica 2
Elettromagnetismo
A.A. 2002/2003

Roma, 22/01/2003

SOLUZIONI

1)

$$q\,E = mg\ \mathrm{tg}\,\alpha$$

$$E = \frac{V}{d}$$

$$q\,\frac{V}{d} = mg\ \mathrm{tg}\,\alpha$$

$$V = \frac{mg\,d}{q}\,\mathrm{tg}\,\alpha$$

$$V = \frac{3\cdot 10^{-4}\cdot 9.8\cdot 7\cdot 10^{-2}}{6\cdot 10^{-7}}\,0.47 = 161.21\ \mathrm{V}$$

---

2)

$$\Phi(\vec{B}) = \int_S \vec{B}\cdot\hat{n}\,dS = \int_x^{x+a} B\,b\,dx = \frac{\mu_0\,I\,b}{2\pi}\int_x^{x+a}\frac{dx}{x} = \frac{\mu_0\,I\,b}{2\pi}\log\frac{x+a}{x}$$

$$x = d_0 + v\,t$$

$$\Phi(\vec{B}) = \frac{\mu_0\,I\,b}{2\pi}\log\frac{d_0+v\,t+a}{d_0+v\,t}$$

$$f = -\frac{d\Phi(\vec{B})}{d\,t} = \frac{\mu_0\,I\,a\,b\,v}{2\pi}\,\frac{1}{(d_0+v\,t+a)(d_0+v\,t)} = \frac{\mu_0\,I\,a\,b\,v}{2\pi}\,\frac{1}{(d_0+v\,t_1+a)(d_0+v\,t_1)} =$$

$$= \frac{12.56\cdot 10^{-7}\cdot 1\cdot 10^{-1}\cdot 2\cdot 10^{-1}\cdot 4\cdot 10^{-1}\cdot 2\cdot 10^{-3}}{2\cdot 3.14}\,\frac{1}{\left(3\cdot 10^{-3}+2\cdot 10^{-3}\cdot 1+2\cdot 10^{-1}\right)\left(3\cdot 10^{-3}+2\cdot 10^{-3}\cdot 1\right)} = 3.12\cdot 10^{-9}\ \mathrm{V}$$

---

3)

$$\oint \vec{E}\cdot d\vec{l} = \int_S \mathrm{rot}\,\vec{E}\cdot\hat{n}\,dS = -\int_s \frac{\partial\vec{B}}{\partial t}\cdot\hat{n}\,dS$$

$$\oint \vec{E}\cdot d\vec{l} = -\int_S \frac{d\,B_x}{d\,t}\,dS = \int_S \omega\,B_0\ \mathrm{sen}\,\omega\,t\,dS = \omega\,B_0\,\pi\,r^2\ \mathrm{sen}\,\omega\,t$$

$$\left.\oint \vec{E}\cdot d\vec{l}\,\right|_{t=t_0} = 2\cdot 10^{-2}\cdot 10^{-1}\cdot 3.14\cdot 10^{-2}\ \mathrm{sen}\,(1.5\,\pi) = -6.28\cdot 10^{-5}\,\mathrm{V}$$