1º Teste Teo 20/4/2004

VERSÃO D

Solução:

a) $0 < r < r_1$

$\vec{D} = \frac{\lambda}{2\pi} \frac{1}{r} \vec{e}_r$; $\vec{E} = \frac{\lambda}{2\pi\varepsilon_0} \frac{1}{r} \vec{e}_r$; $\vec{P} = 0$ (vazio)

$r_1 < r < r_2$

$\vec{D} = \frac{\lambda}{2\pi} \frac{1}{r} \vec{e}_r$; $\vec{E} = \frac{\lambda}{2\pi\varepsilon} \frac{1}{r} \vec{e}_r$; $\vec{P} = \frac{\varepsilon - \varepsilon_0}{\varepsilon} \frac{\lambda}{2\pi} \frac{1}{r} \vec{e}_r$

$r > r_2$

$\vec{D} = \frac{\lambda}{2\pi} \frac{1}{r} \vec{e}_r$; $\vec{E} = \frac{\lambda}{2\pi\varepsilon_0} \frac{1}{r} \vec{e}_r$; $\vec{P} = 0$ (vazio)

b) $\sigma' = \vec{P} \cdot \vec{n}$ com $\vec{n} = -\vec{e}_r$ $\Rightarrow$ $\boxed{\sigma' = -\frac{\varepsilon - \varepsilon_0}{\varepsilon} \frac{\lambda}{2\pi} \frac{1}{r_1} < 0}$

c) $r > r_2$

$\phi(r) = -\frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{r}{r_2}\right)$

$r_1 < r < r_2$

$\phi(r) = \frac{\lambda}{2\pi\varepsilon} \ln\left(\frac{r_2}{r}\right)$

$0 < r < r_1$

$\phi(r) = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{r_1}{r}\right) + \frac{\lambda}{2\pi\varepsilon} \ln\left(\frac{r_2}{r_1}\right)$

d)