淡江大學八十七學年度碩士班入學考試試題

系別：電機工程學系　　科目：電磁學(含電磁波)

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一、A charge distribution with spherical symmetry has density

$$\rho = \begin{cases} \dfrac{\rho_0 r}{R}, & 0 \le r \le R \\ 0, & r > R \end{cases} \qquad (20\%)$$

determine potential V everywhere and the energy stored in region $r<R$.

二、Two conducting cones ($\theta = \frac{\pi}{10}$ and $\theta = \frac{\pi}{6}$) of infinite extent are separated by an infinitesimal gap at $r=0$. If potential $V(\theta = \frac{\pi}{10}) = 0$ and $V(\theta = \frac{\pi}{6}) = 50V$, Find V and eletric field $\bar{E}$ between the cones. (20%)

三、Determine the inductance per unit length for a two wire transmission line with separation distance d. The radius of each wire is a. (20%)

四、The plane wave $\bar{E} = 50 \sin(\omega t - 5x)\,\hat{a}_y$ V/m in a lossless medium ($\mu = 4\mu_0$, $\epsilon = \epsilon_0$) encounters a lossy medium ($\mu = \mu_0$, $\epsilon = 4\epsilon_0$ $\sigma = 0.1$ mhos/m) normal to the x-axis at $x=0$, find the reflected and transmitted $\bar{E}$ and $\bar{H}$ fields. (20%)

五、For the two short-dipole antenna array as shown in the figure, write down and sketch the normalized field pattern when the current are fed 90° out of phase and $d = (\frac{1}{4}$ wavelength). (20%)