國立臺灣大學 102 學年度碩士班招生考試試題

1.(28%)
(a) (5%) What is an anisotropic dielectric material?
(b) (5%) What is the Poynting vector?
(c) (6%) What is the boundary condition for the interface between two perfect dielectric media.
(d) (6%) State the divergence theorem and discuss its application.
(e) (6%) What is a magnetic dipole? How is it related to the magnetic flux density?

2. (15%) Find the induced emf around the rectangular closed path C connecting the point (0,0,0), (a,0,0), (a,b,0),(0,b,0), and (0,0,0), in that order, for the magnetic field given by

$$\vec{B} = B_0 \sin(\frac{\pi x}{a}) \cos \omega t \vec{a}_z$$

3. (18%) The variation with z for t=0 of a function $f(z,t)$ representing a traveling wave propagating in the +z direction with velocity 100m/s is shown in Fig. 3.
(a) Sketch f versus z for t=1 s.
(b) Sketch f versus t for z=0.
(c) Sketch f versus t for z=100m.

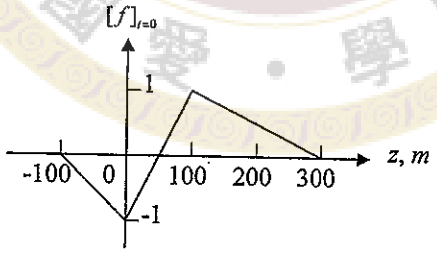

Fig. 3

4.(15%) Let us consider the charge distribution given by

$$\rho = \begin{cases} \rho_0 x/a & for \quad -a < x < a \\ 0 & otherwise \end{cases}$$

Find the corresponding displacement flux density.

見背面

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5. (24%) The magnetic field of a uniform plane wave propagating in a nonmagnetic, $\mu = \mu_0 = 4\pi \times 10^{-7} H/m$, material medium is given by

$$\vec{H} = H_0 e^{-z} \cos(2\pi \times 10^6 t - z)\bar{a}_x \quad \text{A/m}$$

(a) Find the frequency.
(b) Find the associated electric field.
(c) Find the time-average power flow per unit area normal to the z direction.
(d) Find the time-average power dissipated in the volume bounded by the planes x=0, x=1, y=0, y=1, z=0, and z=1.

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