大同大學 九十六學年度 碩士班入學考 試題

註:本次考試<u>不可以</u>參考自己的書籍及筆記; 　<u>不可以</u>使用字典; 　<u>可以</u>使用計算器。

1. A $50-\Omega$ lossless line is to be matched to an antenna with $Z_L = (80+j25)\Omega$ using a shorted stub. Use the Smith Chart to determine the stub length and distance between the antenna and stub. [Hint: 共有二組解; 利用提供的 **Smith Chart** 作計算,只在答案卷上說明並給與答案; <u>**Smith Chart** 不評分,繳不繳回,與題目卷一致,依考場規定</u>] (25%).

2. Briefly answer the following questions: (30%)

   a. Explain *Stokes's theorem* in vector operation
   b. What is the relationship between VSWR and reflection coefficient in transmission line? Explain.
   c. What is the *dielectric constant* of materials?
   d. Explain "*eddy current*"
   e. Explain the characteristics of a *plane wave* in free space.

3. The instantaneous expression for the magnetic field intensity of a uniform plane wave propagating in the $+y$ direction in air is given by

$$\overline{H} = \vec{a}_z 4 \times 10^{-6} \cos\left(10^7 \pi t - k_0 y + \frac{\pi}{4}\right) A/m$$

   a) Determine k_0 and the location where H_z vanishes at $t=3$ (ms).
   b) Write the instantaneous expression for $\overline{E}$.
   (20%)

4. (1) For the vector field $\vec{A} = 10e^{-r}\vec{a}_r - 3z\vec{a}_z$, verify the divergence theorem for the cylindrical region enclosed by r =2, z = 0, and z = 4 (10%)
    (2) $f = xy^2 z^3$, Find ∇f (5%)
    (3) Given $V = 5e^{-r}\cos\phi$, find $\nabla^2 V$.(5%)
    (4) $\vec{A} = y\vec{a}_x + xyz\vec{a}_z$, determine if it is solenoidal, conservative, or both. (5%)

The Complete Smith Chart

Black Magic Design

RADIALLY SCALED PARAMETERS

TOWARD LOAD —>   <— TOWARD GENERATOR

CENTER

ORIGIN