大同大學 95 學年度研究所碩士班入學考試試題

考試科目:電磁學　　所別:通訊工程研究所　　第<u>1</u>頁

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>不可以</u>使用計算器。

1. For an air-filled rectangular metal waveguide with inside dimensions of 0.9(inch) by 0.4(inch), find the cut-off wavelength for the dominant mode. If the waveguide has a guided wavelength of 5 (cm), find the operating frequency and the associated group velocity. Also, if the waveguide is 1(cm) long and is terminated at its end by a perfect electric conductor, what would be its input reflection coefficient? (25%)

2. Two fields (A) $\vec{F}=\vec{F}_1=y\vec{a}_x+x\vec{a}_y$, and (B) $\vec{F}=\vec{F}_2=y\vec{a}_x-x\vec{a}_y$ are given. For each one of them, calculate $\int_B^A \vec{F}\bullet\vec{dl}$, where B is at (0,1,0) and A is at (0,-1,0). Which one of the two fields is non-conservative? Please confirm your answer by choosing two different paths and completing the integrations for each field.(25%)

3. Explain the following terms: (25%)
   Lorentz's force equation
   Magnetic Dipole
   Toroidal coil & solenoidal coil
   Hysteresis
   Biot-Savart law

4. A positive point charge Q is at the center of a spherical conducting shell of an inner radius R_i and an outer radius R_o. Determine $\vec{E}$ and V as functions of the radial distance R. (25%)