# 大同大學 102 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　　　　第全頁

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

1. (20%) Explain the following terms: a) skin depth, b) plane wave, c) antenna input impedance, d) wave polarization, e) Magnetic Hysteresis

2. (20%) A charge $Q$ is distributed uniformly over the wall of a circular tube of radius $b$ and height $h$. Determine $V$ and $\vec{E}$ on its axis.
   a) at a point outside the tube, then
   b) at a point inside the tube

3. (20%) Prove that a maximum power is transferred from a voltage source with an internal impedance $Z_g$ to a load impedance $Z_L$ over a lossless transmission line when $Z_i = Z_g^*$, where $Z_i$ is the impedance looking into the loaded line. What is the maximum power-transfer efficiency?

4. (20%) Prove that a linearly polarized plane wave can be resolved into a right-hand circularly polarized wave and a left-hand circularly polarized wave of equal amplitude.

5. (20%) Assume the vector function $\vec{A} = \vec{a}_x 3x^2 y^3 - \vec{a}_y x^3 y^2$,
   a) Find $\oint \vec{A} \cdot d\ell$ around the triangular contour shown right.
   b) Evaluate $\int (\nabla \times \vec{A}) \cdot d\vec{s}$ over the triangular area.
   c) Can $\vec{A}$ be expressed as the gradient of a scalar? Explain