國立彰化師範大學 101 學年度碩士班招生考試試題

系所： 機電工程學系　　組別： 乙組　　科目： 電磁學

☆☆請在答案卷上作答☆☆　　

1. Determine the work done in carrying a -2 (μC) charge from $P_1(2,1,-1)$ to $P_2(8,2,-1)$ in the electic field $E = a_x y + a_y x$.
   (1) along the parabola $x = 2y^2$, (10%)
   (2) along the straight line joining P_1 and P_2. (10%)

2. A cylindrical capacitor of length L consists of coaxial conducting surfaces of radii r_i and r_o. Two dielectric media of different dielectric constants ε_{r1} and ε_{r2} fill the space between the conducting surfaces as shown in Figure 1. Determine its capacitance. (20%)

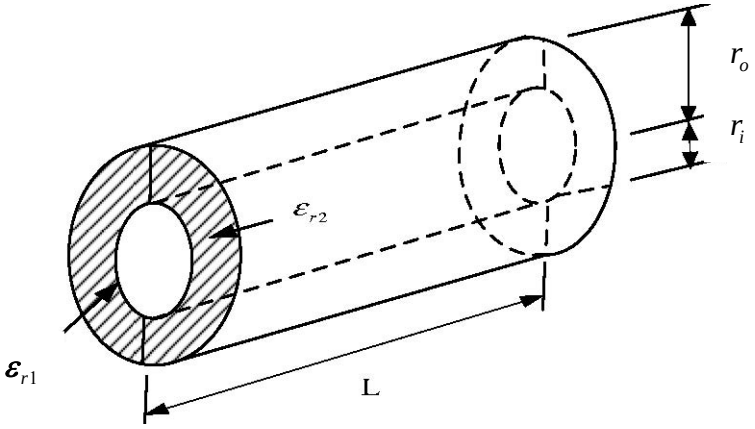

Figure 1

3. Determine the magnetic flux density inside a closely wound toroidal coil with an air core having *N* turns and carrying a current *I*. The toroid has a mean radius *b*, and the radius of each turn is *a*. (10%)

4. Write and explain the expressions of transformer emf and motional emf. (10%)

5. Find the magnetic flux density at a distant point of a small circular loop of radius b that carries current I. (20%)

6. 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. (20%)