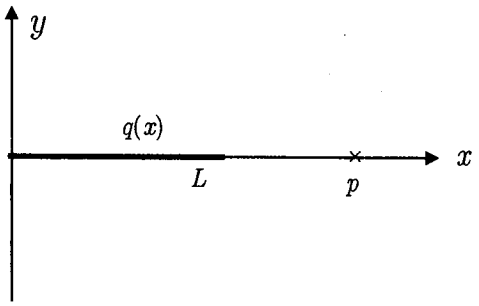
所別：遙測科技碩士學位學程碩士班 不分組(一般生)　科目：普通物理　共 3 頁 第 1 頁

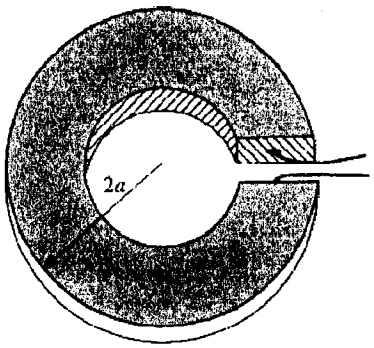
本科考試可使用計算器，廠牌、功能不拘　＊請在試卷答案卷（卡）內作答

電學-磁學 試題　共 5 題, 總分 60 分

1. A line charge extends from x=0 to x=L and has density $q(x) = q_0 x$ Cm^{-1}. Find the E-field and electric potential at the point p ($>L$) on the x-axis. (10%)



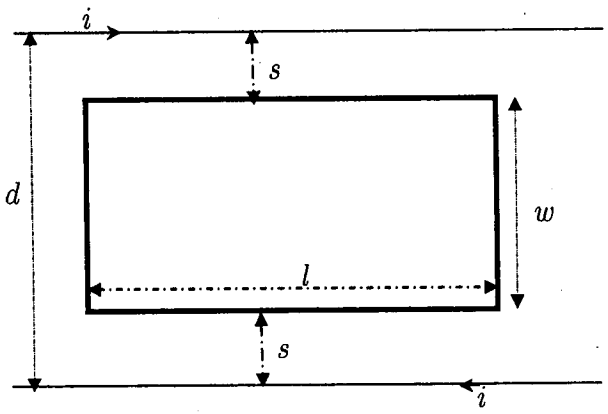
2. A ring is made of a dielectric of resistivity ρ. It has a square cross section of length a on a side, and its outer radius is $2a$. A small slit is made on one side and wires of negligible resistance are connected to the faces exposed by the slit (see Figure below). If the wires were connected into a circuit, what would be the lumped resistance due to the ring? (15%).



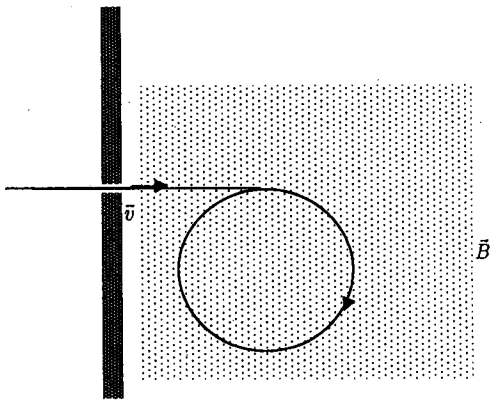
3. A rectangular loop of wire of length l and of width w lies in the plane and is centered between two very long, parallel wires separated at distance d. A time-dependent current $i = I_0 \sin \omega t$ passes through the wires, as indicated in the figure. The loop is at a distance s from the wire. Find the induced electric field in the rectangular loop. (10%)

參考

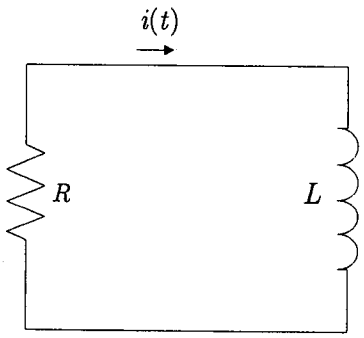
注意:背面有試題



4. A beam of protons is collimated through a narrow slit. The proton enters a region where there is a uniform magnetic field $\vec{B}$ coming out of the paper. The velocity $\vec{v}$ of the protons is perpendicular to $\vec{B}$. The mass of proton is 1.7×10^{-27} kg with charge of 1.6×10^{-19} C. Assuming that $|\vec{v}| = 3 \times 10^{6}$ m/s and $|\vec{B}| = 2$ Tesla. Find the radius of their circular path and frequency. (10%)
(Hint: use also Newton's second law)



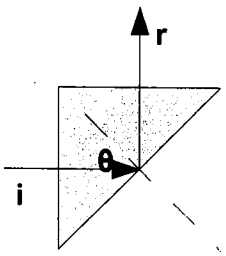
5. Considering the following series resistor-inductor (R-L) circuit. The time-varying current $i(t)$ has initial value of I_0, i.e, $i(0) = I_0$. (15%)
Determine
   (a) $i(t)$
   (b) The power being dissipated in the resistor
   (c) The energy being dissipated in the resistor



參考用

Part II 力學與光學　共 3 題　40 分

6. The following figure shows a triangular prism of glass, a ray incident normal to one face being totally reflected. Assume the angle θ is 45° the index of refraction of air is set equal to 1. Suppose that the index of refraction of the glass is such that total internal refraction just occurs, that is, that θ is the critical angle for total internal refraction. What is the index of refraction of the glass? [15%]



7. What color is the sky of the moon during daytime? And what is the reason? [10%]

8. From the period and radius of revolution of the earth about the sun, find the mass of the sun. [15%]
Assume it is a circular orbit where the earth's period is 365 days and its mean orbital radius is 1.50×10^{11} m .
Note: the Constant of Universal Gravitation is $G=6.67\times10^{-11}$ $m^3/kg\cdot s^2$