

# 國立中央大學 107 學年度碩士班考試入學試題

所別： 太空科學研究所 碩士班 不分組(一般生)  
太空科學研究所 碩士班 不分組(在職生)

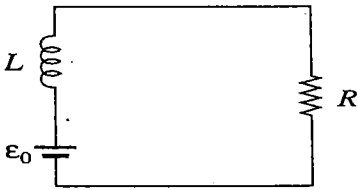
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科目： 電磁學

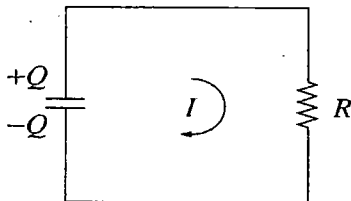
本科考試禁用計算器

\*請在答案卷(卡)內作答

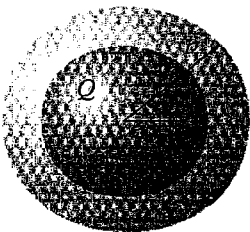
1. Suppose that a battery (which supplies a constant emf  $\epsilon_0$ ) is connected to a circuit of resistance  $R$  and inductance  $L$ , as shown below. If you close the switch at time  $t=0$ , what current flows? (20%)



2. Describe the Helmholtz theorem. (15%)
3. Find the capacitance of two concentric spherical metal shells, with inner radius  $a$  and outer radius  $b$ . (15%)
4. A capacitor  $C$  has been charged up to potential  $V_0$ ; at time  $t=0$ , it is connected to a resistor  $R$ , and begin to discharge, as shown in the following figure.



- (a) Determine the charge on the capacitor as a function of time,  $Q(t)$ . What is the current through the resistor? (10%)
- (b) What was the original energy stored in the capacitor? Confirm that the heat delivered to the resistor is equal to the energy lost by the capacitor. (10%)
5. A spherical conductor, of radius  $a$ , carries a charge  $Q$ , as shown below. It is surrounded by linear dielectric material of susceptibility  $X_e$ , out to radius  $b$ . Find the energy of this configuration. (20%)



6. Please write down the Maxwell's equations. (10%)

參考用