所別： 太空科學研究所 碩士班 不分組(一般生)　　　　共 1 頁　第 1 頁
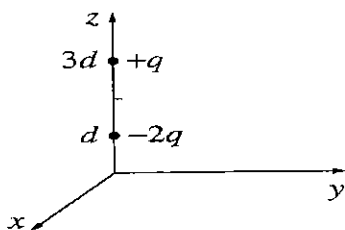
太空科學研究所 碩士班 不分組(在職生)

科目： 電磁學

本科考試禁用計算器　　　　　　　　　　　　　　＊請在答案卷(卡)內作答

1. If V satifies Lapace's equation, show that $V_{ave}(R)=V(0)$ for all R. Where $V_{ave}(R)$ is the average value of V on the surface of a sphere of radis R, and, V(0) is the value at the origin of the sphere.(20%)

2. Describe the Helmholtz theorem. (20%)

3. Find the force on the charge +q in the figure. (The xy plane is a grounded conductor, i.e. v=0)(10%)

4. When you polarize a neutral dielectric, please prove that the total bound charge vanishes. (10%)

5. A large parallel-plate capacitor with uniform surface charge σ on the upper plate and $-\sigma$ on the lower is moving with a constant speed v, as shown in the following figure.
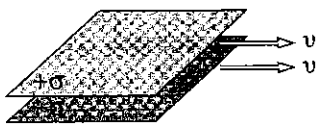
(a) Find the magnetic field between the plates and also above and bwlow them.(5%)

(b) Find the magnetic force per unit area on the upper plate, including its direction.(5%)

(c) At what speed v would the magnetic force balance the electrical force?(10%)

6. A capacitor C is charged up to a voltage V and connected to an inductor L, as shown in the following figure. At time t=0, the switch S is closed. Find the current in the circuit as a function of time(10%). How does your answer change if a resistor R in included in series with C and L(10%)?