

# 國立中央大學九十學年度碩士班研究生入學試題卷

所別: 太空科學研究所 不分組 科目: 太空物理 共    / 頁 第    / 頁

## 太空物理

1. What is the frozen-in-flux condition and its physical meaning? Under what circumstance, the magnetic field lines are also equipotential (等電位) lines? (15%)
2. How to calculate the central temperature of the Sun? (15%)
3. What is the field line equation of the interplanetary magnetic field on the polar coordinate? (Assuming both  $u_r$ , the radial velocity of solar wind, and  $\omega_s$ , the angular rotational frequency of the sun, are constant.) (15%)
4. What is the magnetic field line reconnection? Show that in a steady state model, the outflow velocity of plasmas is approximately equal to the inflow Alfvén speed  $v_{Al} = B_1 / \sqrt{\mu_0 \rho}$ . (20%)
5. Describe the motion of ions and electrons on the equatorial plane of night-side magnetosphere with a dawn-to-dusk electric field  $E$ . (20%)
6. For given magnetic field of  $\vec{B} = B_0 \tanh(z/h)\hat{x} + B_z\hat{z}$  and plasma pressure of  $p = p(x)$ , where  $h$  and  $B_z$  are both constant. Show that such a distribution cannot satisfy the equilibrium condition of  $\nabla p = \vec{j} \times \vec{B}$ . (15%)