國立中央大學109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)

共2頁 第1頁

大空科學研究所碩士班 不分組(在職生)

科目:

太空物理學

本科考試禁用計算器

*請在答案卷(卡)內作答

Space Physics: Ionosphere (50 points)

- 1. Describe the features of the (1) Pedersen (5 points) (2) Hall (5 points) and (3) field-aligned (5 points) conductivity with respect to the altitude throughout the ionosphere.
- 2. Explain the generation mechanism of (1) auroral electrojet (10 points) and (2) equatorial electrojet (10 points).
- 3. Describe the (1) diurnal variation (5 points), (2) seasonal variation (5 points), and (3) geographical variation (5 points) of the ionosphere.



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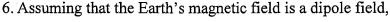
Space Physics: Magnetosphere (50 points)

4. Please explain

- (a) the existence of equilibrium plasma sheet and plasmasphere based on the equilibrium state of MHD momentum equation. (8 points)
- (b) the frozen-in condition qualitatively and illustrate the properties in the low-beta and high-beta plasma. (8 points).

5. Please discuss

- (a) the possible mechanisms of a particle entering into the loss cone from the first adiabatic invariant. (4 points)
- (b) the Alfvén layer of hot electrons on the equatorial plane affected both by solar wind convection and gradient B drift motion. (6 points)
- (c) the direction of cross-tail current based on the particle and fluid points of view. (10 points



$$\vec{B} = -\frac{B_0 R_E^3}{r^3} (2\cos\theta \hat{r} + \sin\theta \hat{\theta}),$$

where r is the radial distance, θ is the colatitude, B_0 is the equatorial magnetic field strength on the surface, and R_E is Earth radius. If the mirror point is roughly at 1 R_E ,

- (a) find the relationship between the latitude λ of mirror point and L using the definition of L value. (4 points)
- (b) determine the magnetic field strength at the mirror point in terms of B_0 and L. (10 points)

