系所別：太空科學研究所　科目：電離層物理

(1). Please answer the following questions:

(a)What is the Chapman Layer? Please state its formation mechanism and characteristics. (10%)

(b) Please explain why the behavior of Earth's ionosphere does not follow the Chapman Layer. (10%)

(2). What is the equatorial anomaly? Please state its formation mechanism. (15%)

(3). Assume that the velocity of height-independent eastward neutral wind in ionospheric E region is 100 m/s, and a constant westward electric field with intensity of 5 mV/m exists in the same region. If the Pedersen and Hall conductivities in this height range are height-independent and are, respectively, $2x10^{-3}$ (Ohm m)$^{-1}$ and $8x10^{-4}$ (Ohm m)$^{-1}$ and the magnetic flux density in this height region pointing toward north is about 0.35 Gauss, please calculate the total current density induced by the electric field and neutral wind. (15%)

(4). The ionosphere will significantly affect the propagation of the signal of Global Positioning System (GPS) satellite. Please answer the following questions.

(a) Why can the Quasi-Longitudinal (QL) approximation be used to describe the GPS signal propagation in the ionosphere even under the condition of θ=88°, where θ is the angle between GPS wave direction and the magnetic filed line. (Assume the carrier frequency of GPS signal is 1.2 GHz). (10%)

(b) Please estimate the time delay of the GPS signal when it propagates through the ionosphere along the path with Total Electron Content (TEC) of 10^{14} cm^{-2}. (10%)

(5) Please explain the relation between auroral electroject and Cowling conductivity. (15%)

(6). It is well known that the geomagnetic field plays a vital role in determining the behavior of Earth's ionosphere. What will happen to the ionosphere if the geomagnetic field is disappeared. (15%)