國立臺灣師範大學 101 學年度碩士班招生考試試題

科目：地球物理學　　　　　　　　　　適用系所：地球科學系

注意：1.本試題共 1 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

1. Using examples, briefly describe what are meant by the following terms in the context of geophysical method?
   (a) Forward modeling (10 points)
   (b) Inverse methods (10 points)

2. Angular momentum is an important physical quantity.
   (a) Please draw a figure illustrating the physical meaning of the angular momentum. (10 points)
   (b) Give an example of physical evidence showing that angular momentum is conserved in the Earth. (10 points)

3. How do geophysicists determine the virtual geomagnetic pole (VGP) and the mean virtual geomagnetic pole (MVGP)? (10 points)
   Why that the MVGP coincides with the geographic pole? (10 points)

4. A simple method to explain the Earth tides is by using the "revolution without rotation" model. Sketch a figure illustrating that the centrifugal (離心) acceleration of this motion has therefore the same magnitude at all points in the Earth. (20 points)

5. For the equipotential surface of a spheroid with flattening f, a simple relation is found between the constant f, $m = \dfrac{\omega^2 a}{g_e}$ (the ratio of the equatorial centrifugal acceleration to the equatorial gravity), and $J_2 = \dfrac{1}{3}(2f - m) = \dfrac{C-A}{C}\dfrac{C}{ER^2}$, where E is the mass of the sphere; A, B, and C are the principal moments of inertia of the sphere; R is the radius of the sphere. Prove that the density of the Earth must increase towards the center. (20 points)

   (Hint: The quantities f, m, and (C-A)/C are each equal to approximately 1/300. The C of a hollow spherical shell is $0.66ER^2$, and a solid sphere with uniform density is $0.4ER^2$.)