

(禁止使用任何計算機)

1. The three plates *A*, *B*, and *C* meet at a ridge-ridge-ridge (RRR)-type triple junction as shown in Figure 1. The ridge between plates *B* and *C* has a half-spreading rate of 4 cm/yr.
 - (a) Calculate the half spreading rates and spreading directions between plates *A* and *B* and between plates *A* and *C*. (6%)
 - (b) Use a graph to show that the RRR-type triple junction is always stable. (4%)

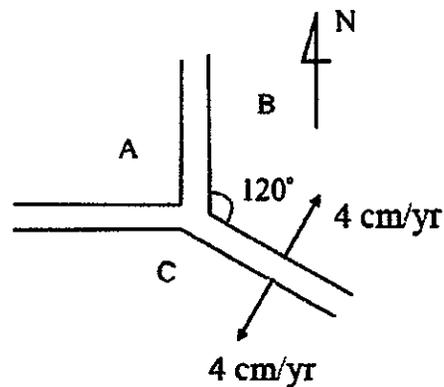


Figure 1

2.
 - (a) Explain how the moment tensor is used to represent the general source mechanism. (5%)
 - (b) What would the moment tensor be like for a double-couple earthquake occurring on an E-W striking, right-lateral strike-slip fault. (5%)
3. Explain the following seismic phenomena and what their physical causes are. (25%)
 - (a) SKS splitting
 - (b) seismic shadow zone
 - (c) subterranean rumbling (earthquake sound)
 - (d) surface wave dispersion
 - (e) seismic coda waves
4. The geological records show that the earth's magnetic field has lasted at least for 3 billion years.
 - (a) What are three main factors required for a planet like the earth to have a self-sustaining magnetic field? (9%)
 - (b) Give at least two observational evidences from geological records that prove the geomagnetic polarity reversals are common in the earth's history? (6%)

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5. The thermal structure of the mantle plays an important role for large-scale mantle dynamics.
- (a) Explain what the mantle potential temperature and adiabat are. (8%)
- (b) Draw the temperature of the earth's mantle as a function of depth, i.e., geotherm, and explain how it is derived and what mechanisms control the geotherm. (12%)
6. Figure 2 shows that the spherical planet-A has a radius a and uniform density ρ , and the planet-B is hollow inside with a radius a and has an outer shell with thickness b ($b \ll a$) and density ρ .
- (a) Calculate and draw the gravity acceleration observed at a distance r from the center for the planet-A and planet-B. (10%)
- (b) For a self-rotating planet with uniform density, the ratio (I/Ma^2) between the moment inertia with respect to the rotational axis, I , and the product of its mass (M) and squared radius (a) is equal to 0.4. We have known $I/Ma^2=0.3307$ and 0.3935 for the Earth and Moon, respectively, and the Moon has a crust, mantle, iron-rich core like the Earth. From these information, can you tell which one, the Earth or the Moon, has a smaller volume fraction of the core? Give your reasoning. (5%)
- (c) When conducting the gravity survey at land and sea, several corrections are usually applied to the measured gravity data and the remaining gravity anomalies are then used for studying the earth's internal structure. These corrections include latitude correction, Eötvös correction, free-air correction, and Bouguer correction. Which corrections among these four are made to remove the effects due to the earth's self-rotation. (5%)

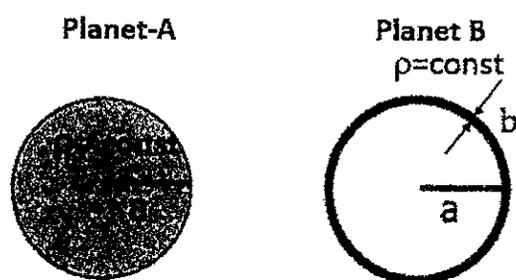


Figure 2