國立中央大學102學年度碩士班考試入學試題卷

所別：地球科學學系地球物理碩士班 不分組(一般生)　科目：普通物理學　共 1 頁 第 1 頁
地球科學學系地球物理碩士班 不分組(在職生)

本科考試禁用計算器　＊請在試卷答案卷（卡）內作答

參考用

(一) Wave (30%)

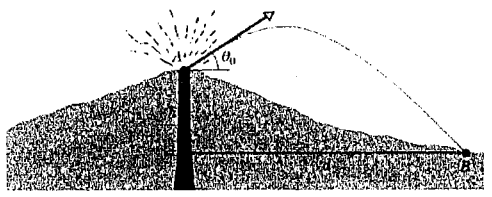
(1) What is "wave" ? Please derive wave equation. (15%)

(2) Please derive the energy (power) transported by a string wave (describe it by string density, wave velocity, wave amplitude and propagating velocity, etc.). (15%)

(二) Gravity and projectile motion (20%)

(1) What is the definition of "weightlessness'? (5%)

(2) During volcanic eruptions, chunks of solid rock can be blasted out of the volcano; these projectiles are called volcanic bombs. The right figure shows the cross section of Mt. Fuji, in Japan. (a) At what initial speed would a bomb have to be ejected, at angle θ_0 to the horizontal, from the vent at A in order to fall at the foot of the volcano at B, at a vertical distance h and horizontal distance d? Ignore, for the moment, the effects of air on the bomb's travel. (b) What would be the time of flight? (c) Would the effect of the air increase or decrease your answer in (a)? (15%)



(三) Force, energy and SHM (30%)

(1) 請解釋為何在自然環境中，物體有往低位能處運動的趨勢. (15%)

(2) 若一位能隨位置變化曲線方程式為 $U(x)=-x^2+\frac{x^4}{2}$，請描述在 x 為多少時的微小震幅改變會產生簡諧運動 SHM 的現象? 其週期又為多少? (15%)

(四) Heat transfer (20%)

(1) How heat energy can be transferred from one place to another? (5%)

(2) As shown in the right figure, a tank of water has been outdoors in cold weather and a slab of ice ***d*** cm thick has formed on its surface. The air above is at T_L ℃ and the water is at T_H ℃ ($T_H > T_L$, and $T_L < 0$). Calculate the rate of ice formation (in centimeters per hour) on the ice slab. Take the thermal conductivity of ice to be k cal/s・cm・℃, its density to be ρ g/cm^3, and L_F is the heat of fusion for water. Assume no energy transfer through the tank wall or bottom. (15%)