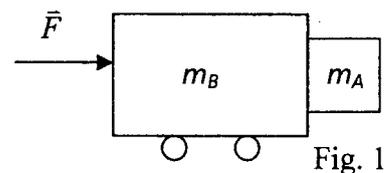


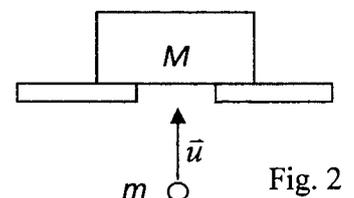
※ 考生請注意：本試題不可使用計算機

1. In a circular motion, the tangential speed of the moving particle is $v(t)=3t^2+2$, where the unit of v is m/s, and the unit of t is s. (a) Using dimensional analysis, find the *units* of constants 3 and 2 in $v(t)$ (2%). (b) Find the magnitudes of the instantaneous *tangential* and *centripetal* acceleration at $t=0.1$ s. (4%) (c) Find the *distance* travelled by the particle from $t=0.1$ s to $t=0.2$ s. (4%)

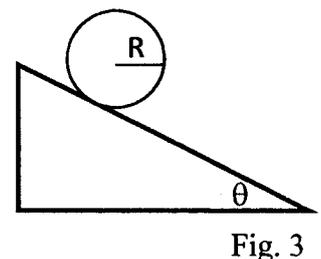
2. In Fig. 1, block A of mass m_A is on the front surface of cart B of mass m_B . An external force \vec{F} acts on B. What is the *minimum coefficient of static friction* between A and B for A not to slide down? (10%)



3. In Fig. 2, a projective of mass m strikes a stationary block of mass M from below with a velocity \vec{u} . The projective embeds in the block. To what *height* does the block rise? (10%)



4. As shown in Fig. 3, a disk of mass M and radius R rolls down an incline with an inclining angle θ . The coefficient of static friction between the cylinder and the incline is μ_s . If the disk is rolling without slipping: (a) Find the *linear acceleration* of the *center of mass* of the disk. (6%) (b) For pure rolling without slipping, find the *minimum value* of μ_s . (4%) (The rotational inertia of a disk about the axis through its center is $MR^2/2$)



5. (a) What is “conservative force”? (4%) (b) From the potential energy function $U(r) = Ce^{-Br}/r$, find the conservative force $\vec{F}(r)$ (6%). (C and B are constants)

6. One planet has radius R and mass M . Find the *gravitational force* from the planet on a particle of mass m at a distance (a) $0.5R$ (5%), and (b) $2R$ (5%) from the center of the planet. (c) If the particle is orbiting around the center of the planet with a radius $r=10R$, find the *orbiting speed* of the particle. (5%) (d) Find the *escape speed* of a particle at a distance $10R$ from the center of the planet. (5%)

(背面仍有題目,請繼續作答)

系所組別： 地球科學系甲、乙組

考試科目： 普通物理

考試日期： 0224，節次： 2

※ 考生請注意：本試題不可使用計算機

7. A infinitely large plane has uniform area charge density σ . Find the *electric field* outside the plane. (10%)

8. In Fig. 4, a potential difference V is applied across a capacitor arrangement with capacitances C_1 , C_2 , and C_3 . Find the *stored charges* and *potential energies* in capacitors C_1 , C_2 , and C_3 (10%)

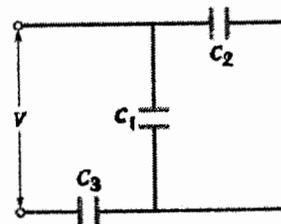


Fig. 4

9. Fig. 5 shows a cross section of a long thin ribbon of width W that is carrying a uniformly distributed total current I into the page. Calculate the magnitude of the magnetic field at a point P in the plane of the ribbon at a distance d from its edge. (Hint: Think the ribbon as being constructed from many long, thin, parallel wires.) (10%)

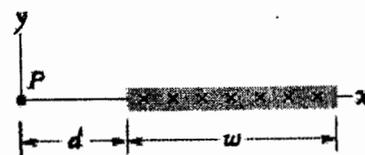


Fig. 5