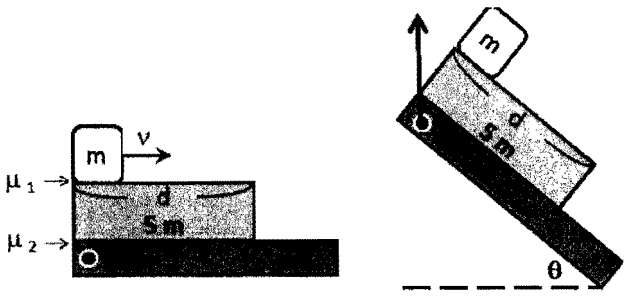
淡江大學 107 學年度日間部寒假轉學生招生考試試題

系別：物理系二年級　　科目：普通物理

考試日期：1 月 13 日(星期日) 第 1 節　　本試題共 4 大題， 1 頁

1. A block1 of mass ***m*** is sent sliding with an initial velocity v along another block2 of mass ***5m***, starting at one end of the block2 (with a disnatce ***d***). The coefficient of kinetic friction of block1-block2 and block2-slab is μ_1 and μ_2, respectively. (μ_1=11μ_2)



(a) Determine the relative acceleration between block1 and block2. **[10%]**

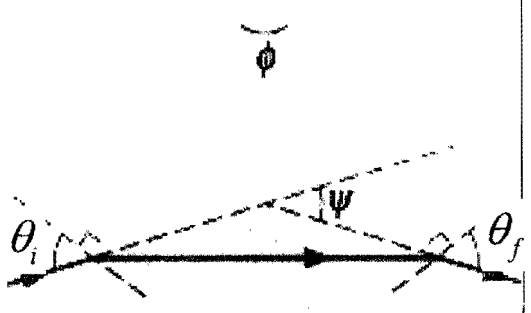
(b) Find the minimum value of *v* such that block1 could reach the other end of block2. **[5%]**

(c) If the whole systems is lift at a horizontal angle θ, determine the relative acceleration between block1 and block2. **[10%]**

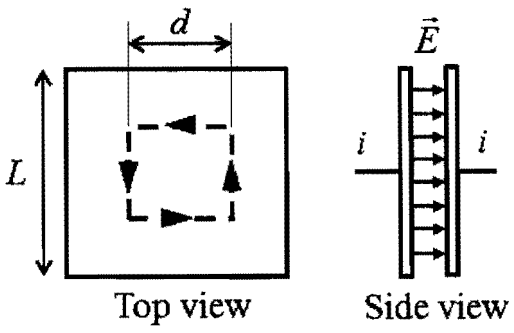
2. A ray is incident on one face of triangular glass prism in air. The incident angle θ_i is chosen so that θ_i=θ_f to yield the minimum deviation angle. Show that the index of refraction n of the glass prism is

$$n = \sin\left(\frac{\psi+\phi}{2}\right)\sin^{-1}\left(\frac{\phi}{2}\right)$$

where ψ and ϕ is the deviation and vertex angle, respectively. **[15%]**



3. A parallel-plate capacitor has square plates of edge length ***L*** is charged by a current ***i*** to produce a uniform electric field $\vec{E}$ which is perpendicular to the plates. (a) What is the displacement current i_d between plates. **[10%]** (b) What is $d\vec{E}/dt$ of this region? **[10%]** (c) What is the i_d' encircled by the square dashed path of edge length ***d***. **[10%]** (d)What is the value of $\oint \vec{B}\cdot d\vec{s}$ around this dashed path? **[10%]**



4. A baton is composed of one uniform slender rod (with length ***L*** and mass ***M***) and two uniform solid spheres (with radius ***R*** and mass ***m***). In order to calculate the moment of inertia (I) of the baton about the axis perpendicular to the center of the stick, please (a) determine the inertia of the individual slender rod I_{rod} and sphere I_{sphere} **[10%]** (b)calculate I_{baton} using parallel-axis theorem and its rotational kinetic energy with angular speed ω **[10%]**