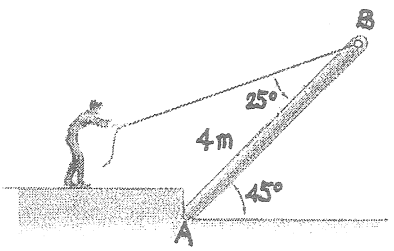
國　立　清　華　大　學　命　題　紙

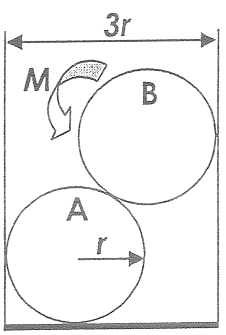
97 學年度 動机 系（所） 丙、丁 組碩士班入學考試

科目 應用力學 科目代碼 1102 (120乙) 共 2 頁第 1 頁 *請在【答案卷卡】內作答

1. A man raises a 10-kg joist, of length 4 m, by pulling on a rope. Find the tension T in the rope and the reaction (force and its angle) at A (20 %)

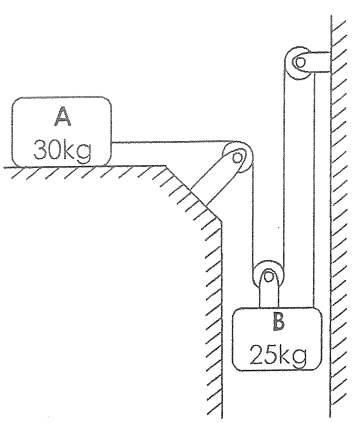


2. Two cylinders, each of weight W and radius r, rest in a box of width $3r$. The sides of the box are smooth. The coefficient of friction between cylinder **A** and the bottom of the box is 0.12 and between the two cylinders is 0.3. Find the couple M that should be applied to cylinder **B** for motion of **B** to impend. (15 %)

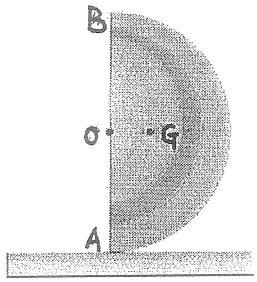


3. The two blocks shown are originally at rest. Neglecting the masses of the pulleys and the effect of friction in the pulleys and assuming that the coefficients of friction between block **A** and the horizontal surface are μ_s=0.25 and μ_k=0.20, determine (a) the acceleration of each block, (b) the tension in the cable.

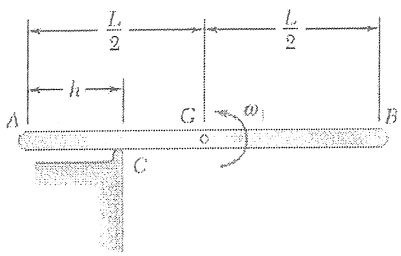
(15 %)



4. A hemisphere of weight W and radius r is released from rest in the position shown. Determine (*a*) the minimum value of μ_s for which the hemisphere starts to roll without sliding, (*b*) the corresponding acceleration of point *B*. [*Hint*: Note that $OG = \frac{3}{8}r$ and that, by the parallel-axis theorem, $\bar{I} = \frac{2}{5}mr^2 - m(OG)^2$.] (15%)



5. A uniform slender rod *AB* of mass *m* and length *L* strikes a rigid frictionless support at point *C* with an angular velocity of magnitude ω_1 when the velocity of its mass center *G* is zero. Knowing that the angular velocity of the rod immediately after the impact is $\omega_1/2$, counterclockwise, and assuming perfectly elastic impact, determine (*a*) the ratio *h*/*L*, (*b*) the velocity of the mass center of the rod immediately after the impact, (*c*) the impulse exerted on the rod at point *C*. (15%)



6. The slab tongs shown are used to lift a weight W. Find the minimum friction coefficient of contact points D and E (assume both contact points have same friction coefficient) required to lift the weight W. The points A, B of the tongs are suspended by two parallel cables F. The angle between AC and BC is 2θ. (20%)