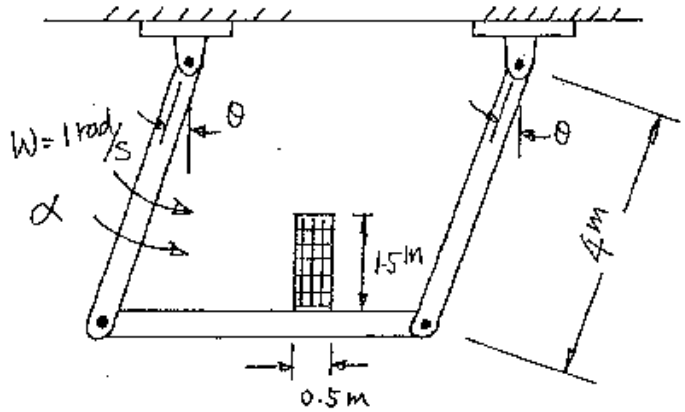
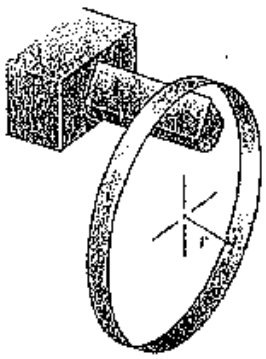
國立中央大學八十八學年度碩士班研究生入學試題卷

所別: 機械工程研究所 甲組 科目: 甲動力學 共 1 頁 第 1 頁

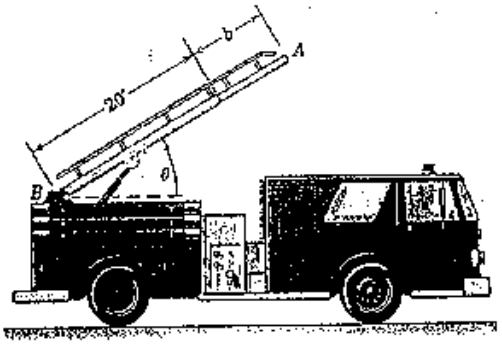
1. The 50-kg uniform crate rests on the platform for which the coefficient of static friction $\mu = 0.5$. The supporting links have an angular velocity $\omega = 1$ rad/sec. (25%)
   (1) Please determine the greatest angular acceleration α of the links so that the crate does not *slip* or *tip* at the instant $\theta = 30°$ as shown.
   (2) Please determine the margin value of μ in the condition of the above angular acceleration α, where the crate slips or tips. Please answer if the value of μ is related to α.



2. Derive the differential equation of motion and determine the period t for the uniform circular hoop of radius r as it oscillates with small amplitude about the horizontal edge. (25%)



3. The fire truck is moving forward at a speed of 35 mile/hr and is decelerating at the rate of 10 ft/sec^2. Simultaneously, the ladder is being raised and extended. At the instant considered, the angle θ is 30° and is increasing at the constant rate 10 °/sec. Also the extension b of the ladder is 5 ft, with $\dot{b} = 2$ ft/sec and $\ddot{b} = -1$ ft/sec^2. Determine the acceleration of the end A of the ladder with respect to the ground. (25%)



4. A 2-kg sphere A is traveling with a velocity v = 5 m/sec when it strikes another 3-kg sphere B which is at rest. If e = 0.5 between A and B, find the velocity of each sphere just after impact. (25%)