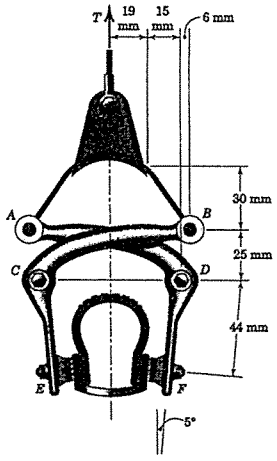
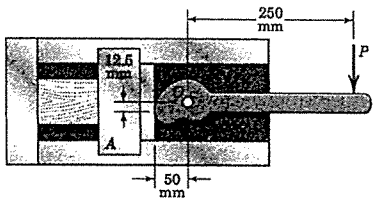
[Note: refer to the figures on bottom for the corresponding problems]

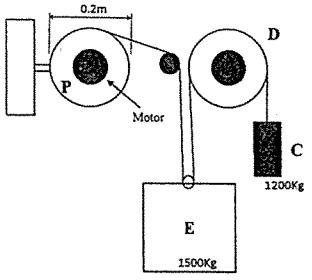
1. The elements of a bicycle center-pull brake are shown in Figure. The two brake arms freely rotate about fixed pivots at C and D (the support bracket is not shown). If the brake-cable tension applied at H is $T = 160$ N, determine the normal forces exerted on the wheel by brakepads E and F. (15 points)
2. The design of the cam-lock vise provides a quick positive clamping action with a friction coefficient between the cam and the movable jaw A of 0.30. (a) As the cam and lever rotating clockwise approaching the locking position shown with P = 150 N, determine the clamping force C. (b) With P removed, find the friction force in the locking position. (c) Determine the force P', opposite from P, required to release the clamp. (20 points)
3. Elevator **E** weighs 1500 Kg and is connected to a 1200 Kg counterweight **C**. (1) Determine the power delivered by the electric motor when the elevator is moving up at a constant speed of 5 m/sec. (2) Determine the torque exerted by the electric motor if the elevator has instantaneous velocity of 5 m/sec and an acceleration of 1 m/sec^2, both upward, and the diameter of the output pulley **P** is 0.2 m. (15 points)
4. Pin B is attached to the rotating arm AC and moves at a constant speed $v_0 = 3$ m/sec. Knowing that pin B slides freely in a slot cut in arm OD, determine the rate $\dot{\theta}$ at which arm OD rotates and the radial component v_r of the velocity of pin B (a) when $\theta = 0°$, (b) when $\theta = 90°$. (15 points)
5. The collar P slides outward at a constant relative speed u along rod AB, which rotates counterclockwise with a constant angular velocity of 20 rpm. Knowing that $r = 250$ mm when $\theta = 0°$ and that the collar reaches B when $\theta = 90°$, determine the magnitude of the acceleration of the collar P just as it reaches B. (20 points)
6. The slender rod AB of length L forms an angle β with the vertical as it strikes the frictionless surface shown with a vertical velocity $\bar{v}_1$ and no angular velocity. Assuming that the impact is **perfectly plastic**, derive an expression for the angular velocity of the rod immediately after the impact (mass moment of inertia of slender rod about G is $\bar{I} = \frac{1}{12}mL^2$). (15 points)



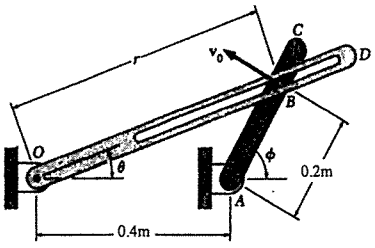
Problem 1



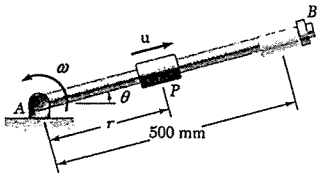
Problem 2



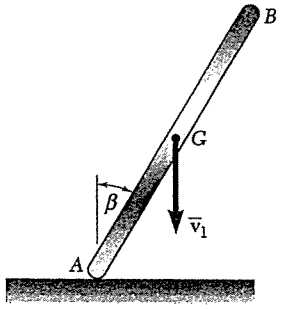
Problem 3



Problem 4



Problem 5



Problem 6

試題隨卷繳回