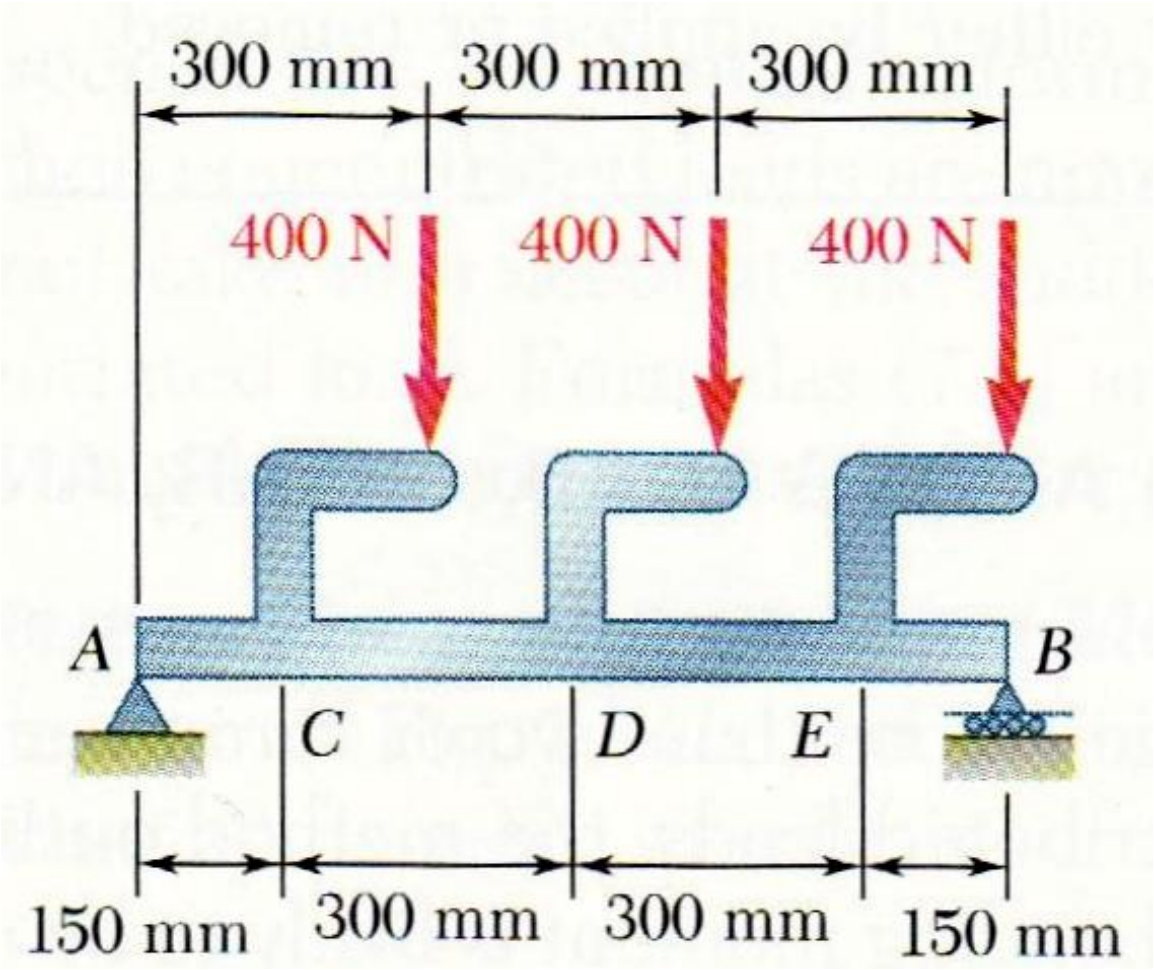
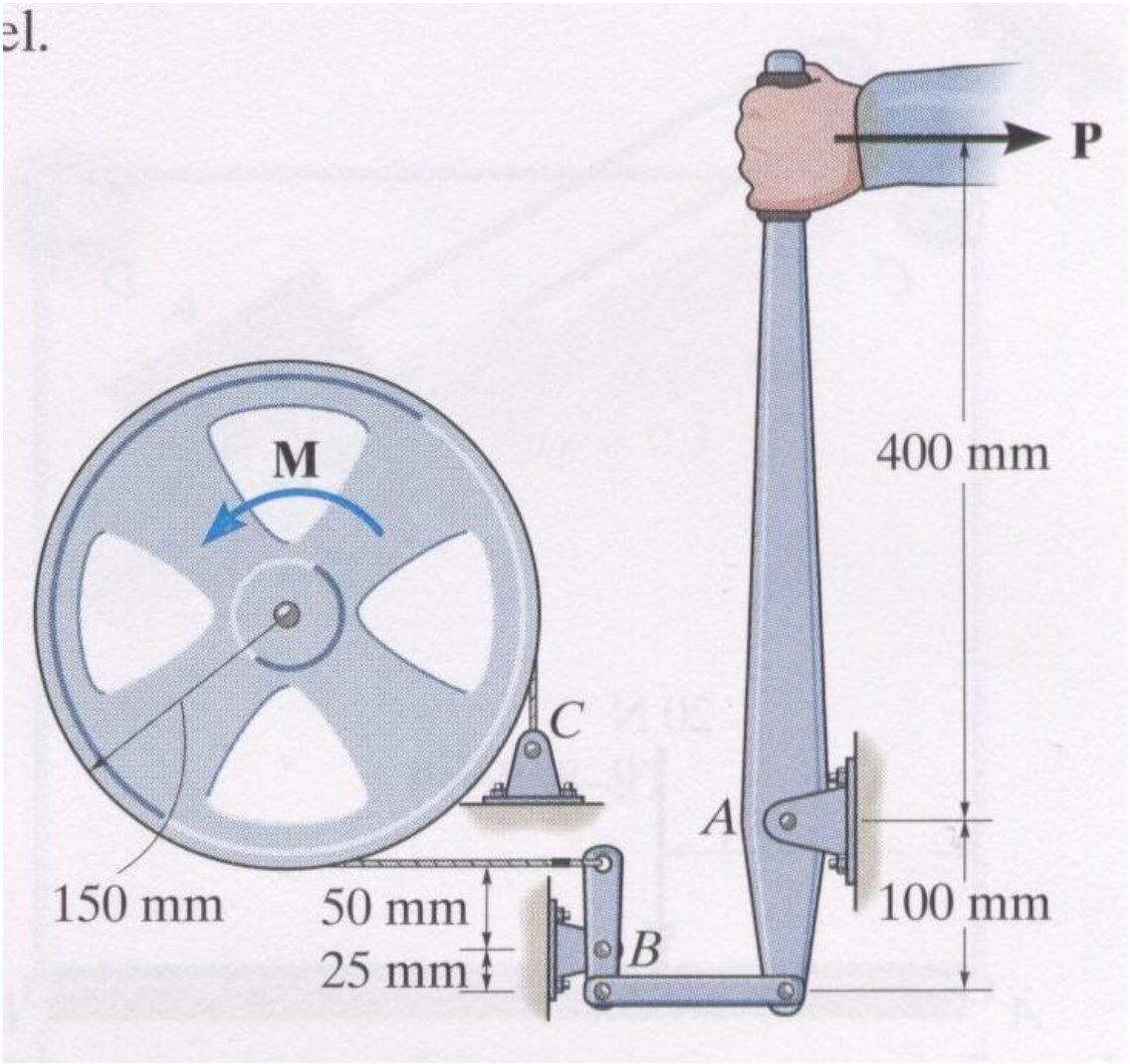
Wright State University ME 212 Statics, Winter 2012
Department of Mechanical and Materials Engineering

FINAL EXAM
Open Book, Closed Notes, Do not write on this sheet, Show all work

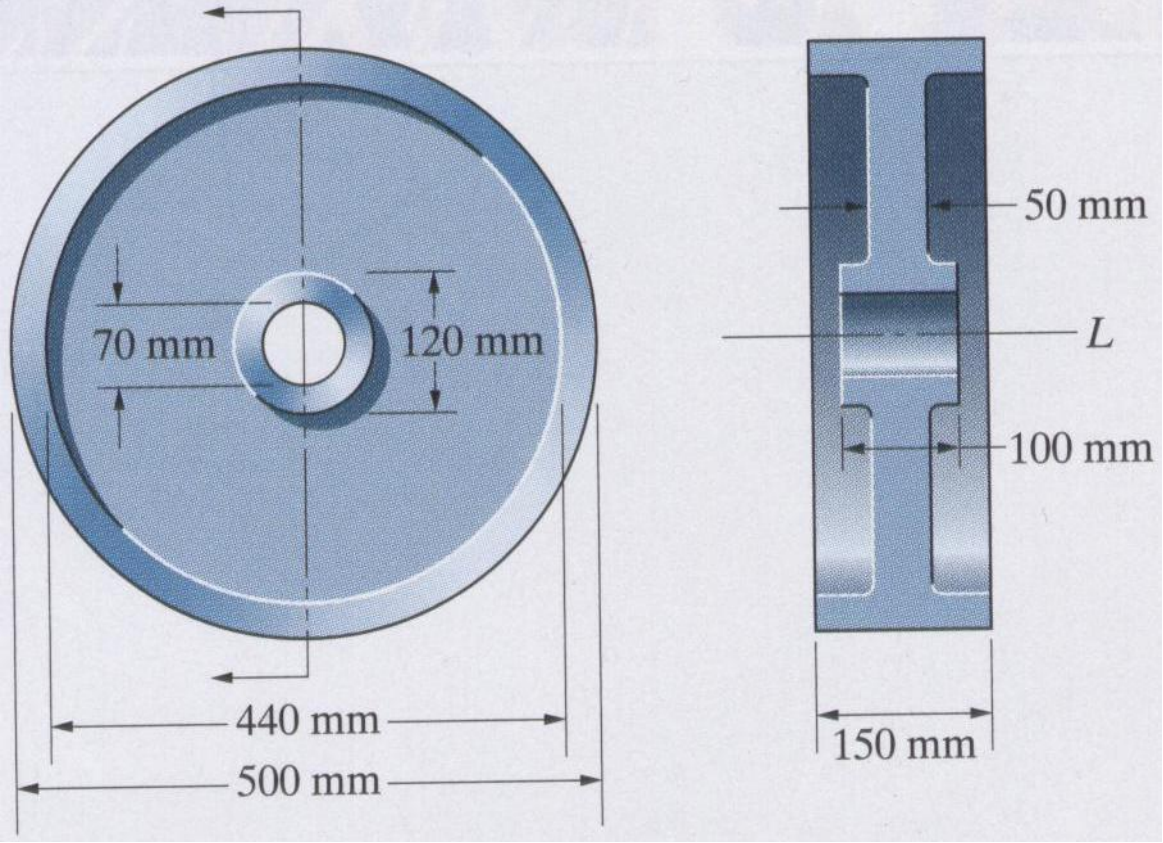
Problem 1: (25 points) Determine the shear and bending-moment equations between points *C* and *D*.



Problem 2: (30 points) The wheel is subjected to a torque of M = 50 N-m. If the coefficient of kinetic friction between the belt and the rim of the wheel is $\mu_k = 0.3$, determine the smallest horizontal force P that must be applied to the lever to stop the wheel.

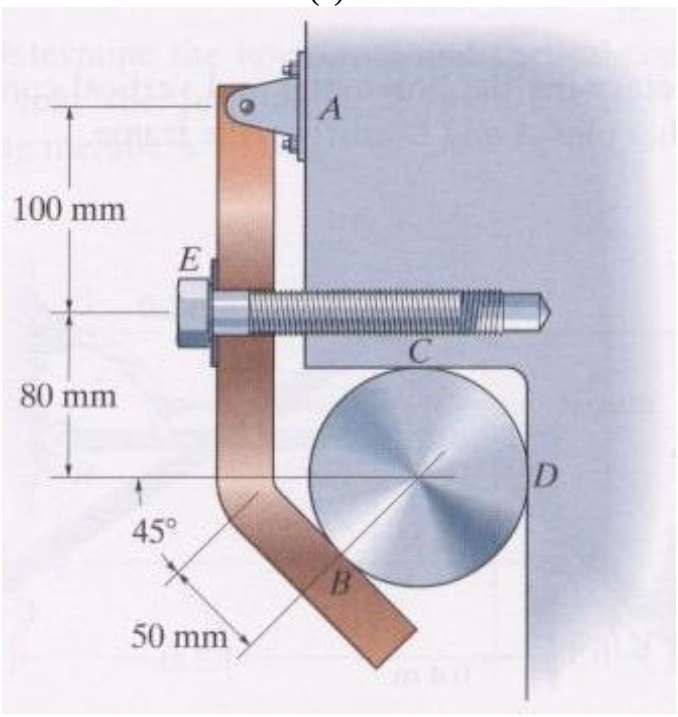


Problem 3: (25 points) Determine the moment of inertia of the 14-kg flywheel about the L axis.



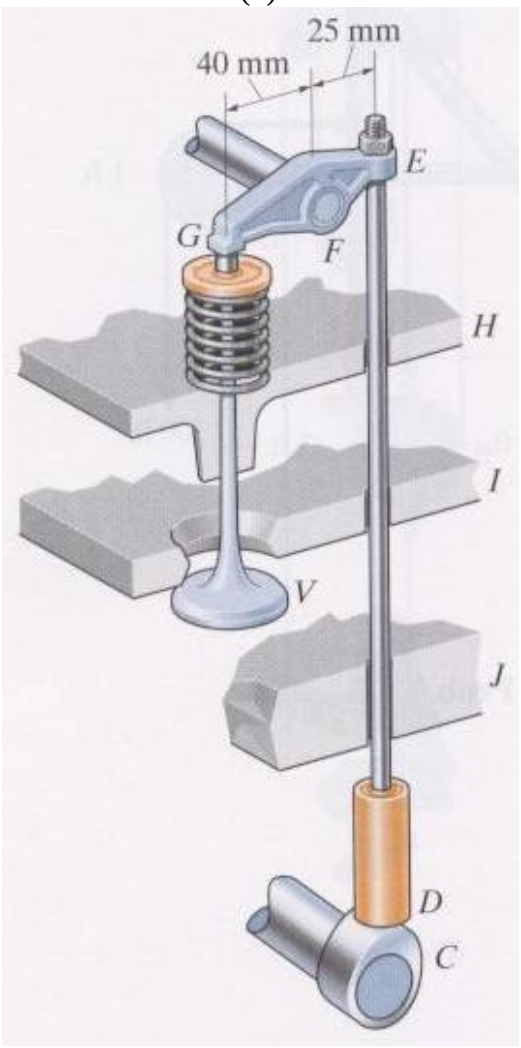
Problem 4: (20 points) Draw the free-body diagrams for the four following situations.

(a)



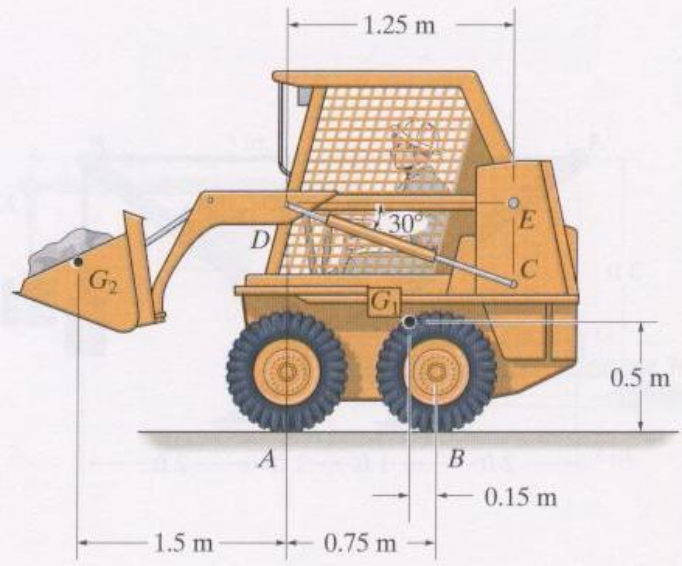
The link is used to hold the rod in place. Determine the required axial force on the screw at *E* if the largest force to be exerted on the rod at *B*, *C*, or *D* is to be 100 N. Also, find the magnitude of the reaction force at pin *A*. Assume all surfaces of contact are smooth.

(b)



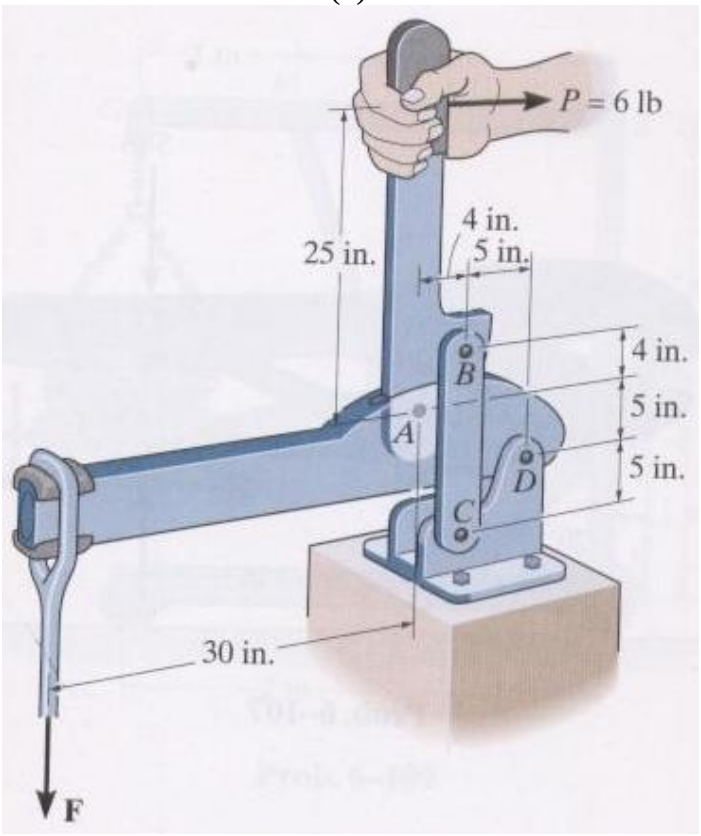
Operation of exhaust and intake valves in an automobile engine consists of the cam *C*, push rod *DE*, rocker arm *EFG* which rides on a smooth bearing at *F*, and a spring and valve, *V*. If the compression in the spring is 20 mm when the valve is open as shown, determine the normal force acting on the cam lobe at *C*. Assume the contact between the cam and the push rod at *D* is normal and smooth. The spring has a stiffness of 300 N/m.

(c)



The skid steer loader has a mass of 1180 kg, and in the position shown the center of mass is at G_1. If there is a 300-kg stone in the bucket, with center of mass at G_2, determine the reactions of each pair of wheels *A* and *B* on the ground and the force in the hydraulic cylinder *CD* and at the pin *E*. There is a similar linkage on each side of the loader.

(d)



If a force of $P = 6$ lb is applied perpendicular to the handle of the mechanism, determine the magnitude of force *F* for equilibrium. The members are pin-connected at *A*, *B*, *C*, and *D*.