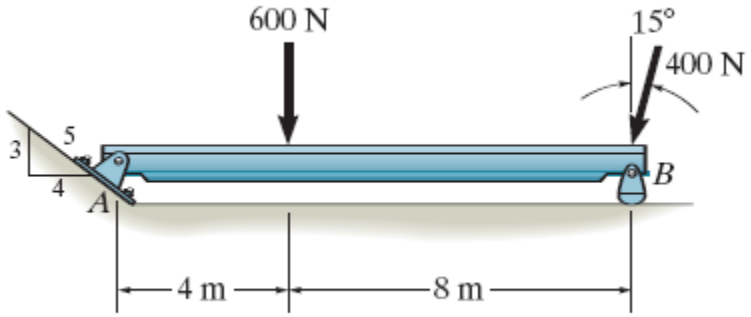
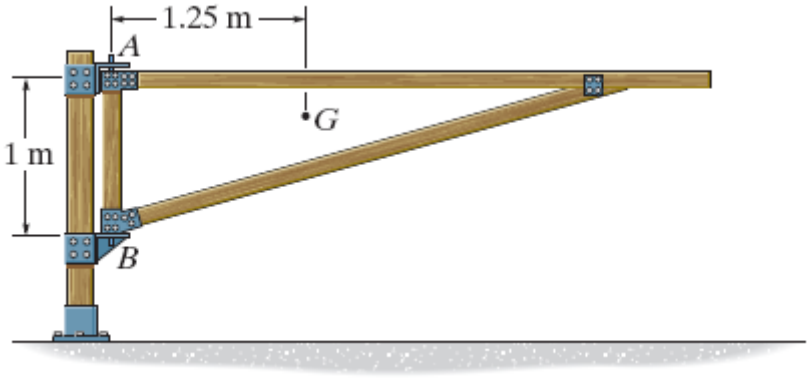
CHAPTER V- EQUILIBRIUM OF A BODY

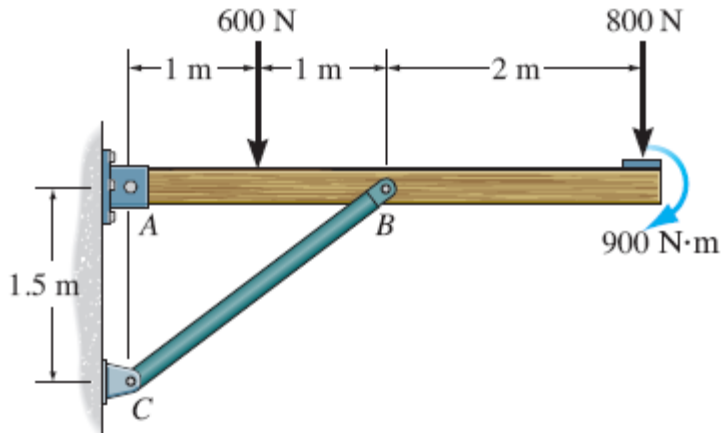
1- Determine the magnitude of the reactions on the beam at *A* and *B*. Neglect the thickness of the beam. (B_y=586 N, F_A =413 N)



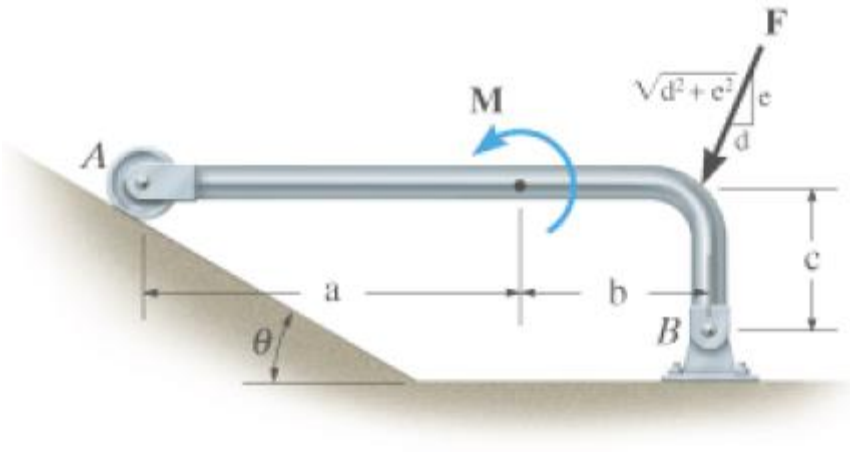
2- The 75-kg gate has a center of mass located at *G*. If *A* supports only a horizontal force and *B* can be assumed as a pin, determine the components of reaction at these supports. (By = 735.75 N, Ax = 919.69 N, Bx = 919.69 N)



3- The overhanging beam is supported by a pin at *A* and the two-force strut *BC*. Determine the horizontal and vertical components of reaction at *A* and the reaction at *B* on the beam. (FBC = 3916.67 N, Ax = 3133.33 N, Ay = 950 N)

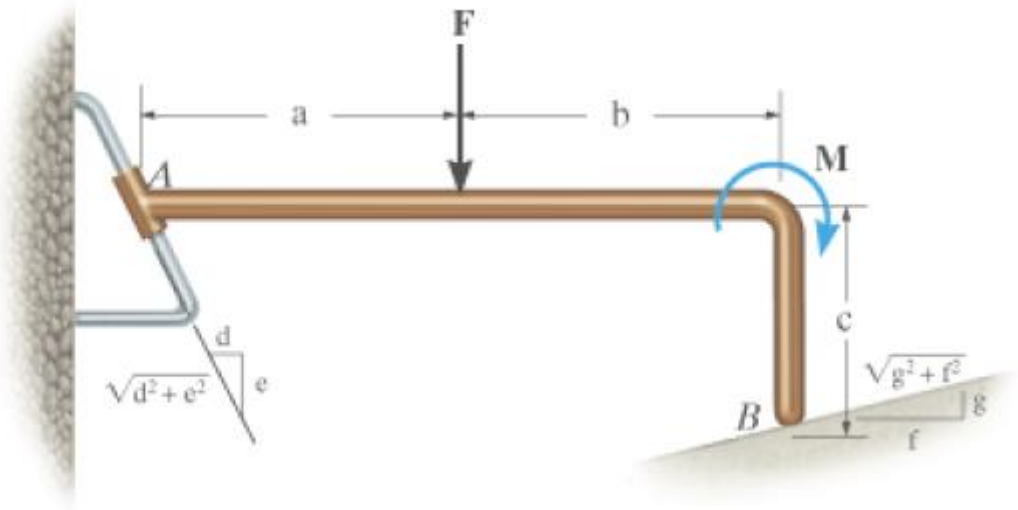


4- Determine the reactions at the roller *A* and pin *B*. (Given: M= 800KN.m, c= 3m, F= 390kN, d= 5, a= 8m, e=12, b= 4m, θ = 30deg)
(R_A= 105kN, B_x=97,4 N, B_y=269 N)



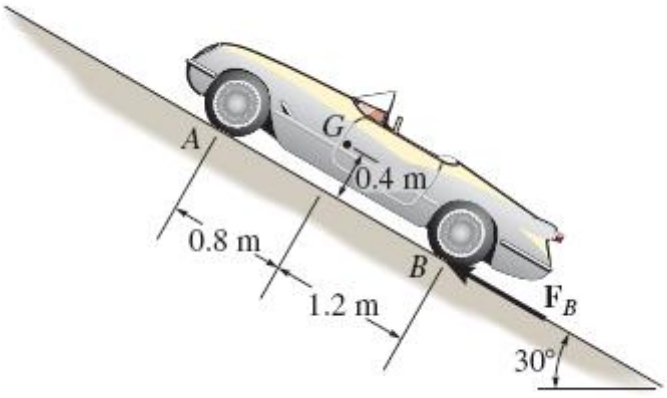
5- Determine the reactions on the bent rod which is supported by a smooth surface at *B* and by a collar at *A*, which is fixed to the rod and is free to slide over the fixed inclined rod. (F=100N, M= 20N.m, a= 0.3m, b= 0.3m, c= 0.2m, d= 3, e= 4, f=12, g= 5)

(M_A=10.6 N.m, N_A=39.7 N, N_B=82.5 N)

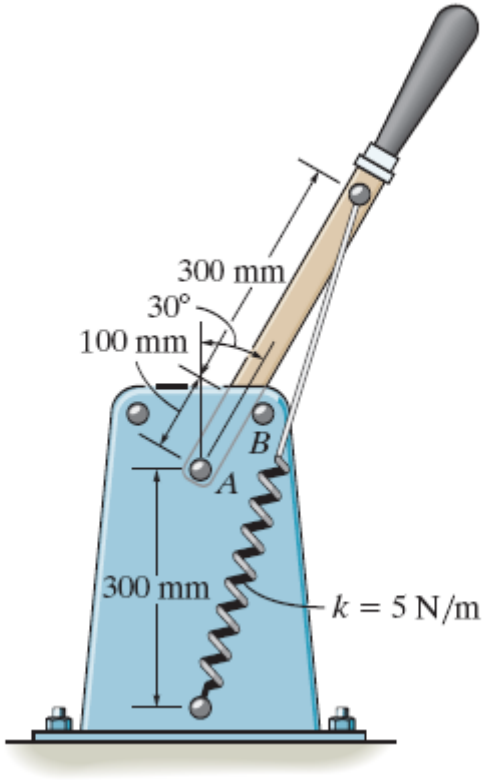


6- The sports car has a mass of 1.5 Mg and mass center at *G*. If the front two springs each have a stiffness of k_A=58 kN/m and the rear two springs each have a stiffness of k_B=65 kN/m determine their compression when the car is parked on the 30° incline. Also, what friction force F_B must be applied to each of the rear wheels to hold the car in equilibrium? *Hint:* First determine the normal force at *A* and *B*, then determine the compression in the springs.

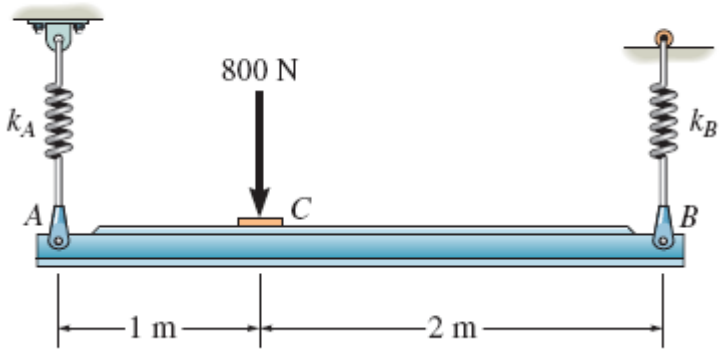
(FB = 3678.75 N = 3.68 kN, x_A=53.2 mm, x_B=50.5 mm)



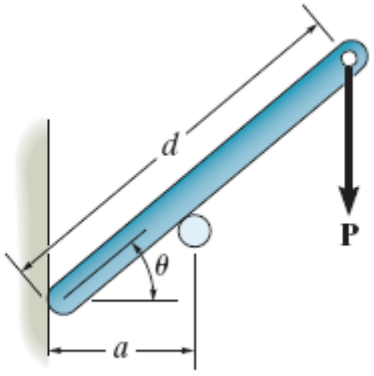
7- The toggle switch consists of a cocking lever that is pinned to a fixed frame at *A* and held in place by the spring which has an unstretched length of 250 mm.Determine the magnitude of the resultant force at *A* and the normal force on the peg at *B* when the lever is in the position shown. (NB = 1. 89 N, FA = 2.52N)



8- The horizontal beam is supported by springs at its ends. Each spring has a stiffness of k = 5 kN/m and is originally unstretched when the beam is in the horizontal position. Determine the angle of tilt of the beam if a load of 800 N is applied at point *C* as shown. (Ø=1.02^0)

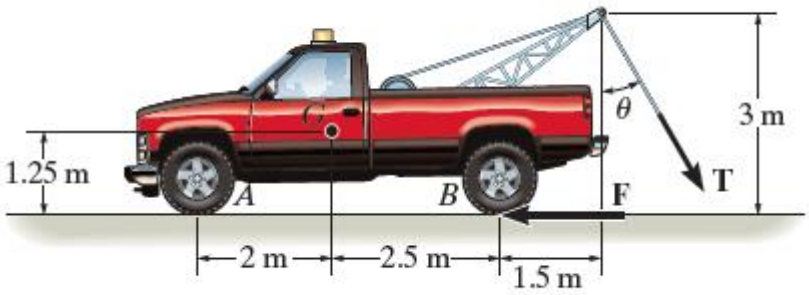


9- If , d=1 and θ = 30deg, determine the normal reaction at the smooth supports and the required distance *a* for the placement of the roller if P = 600 N. Neglect the weight of the bar.
(N=693 N, a=0.650 m)

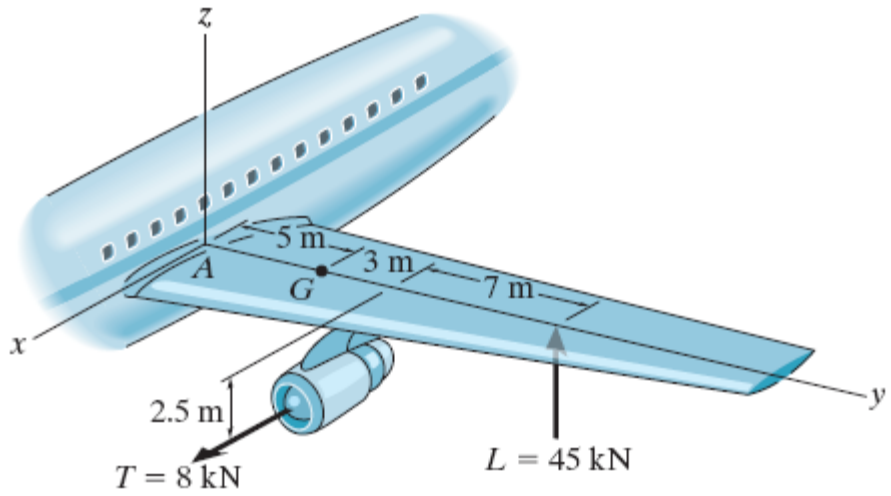


10- The winch cable on a tow truck is subjected to a force of T=6 kN when the cable is directed at θ = 30deg. Determine the magnitudes of the total brake frictional force F for the rear set of wheels *B* and the total normal forces at *both* front wheels *A* and both rear wheels *B* for equilibrium. The truck has a total mass of 4 Mg and mass center at *G*.

(F=5.20 kN, N_A =17.3 kN, N_B =24.9 kN)



11- The wing of the jet aircraft is subjected to a thrust of T=8 kN, from its engine and the resultant lift force L=45 kN. If the mass of the wing is 2.1 Mg and the mass center is at *G*, determine the *x, y, z* components of reaction where the wing is fixed to the fuselage at *A*. (Ax = 8.00 kN, A_y=0, Az = 24.4 kN, My = 20.0 kN.m, Mx = 572 kN.m, Mz = 64.0 kN. M)


z
5 m
3 m
7 m
A
G
x
y
2.5 m
T = 8 kN
L = 45 kN