Midterm exam A
2020/04/01, Wednesday, 4:20 pm – 6:20 pm

1. The pipe shown in Figure 1 is fixed at O. A force **F** = [300**i** – 200**j** + 150**k**] N is applied at B. Determine the moment of force **F** (a) about point O (10'), (b) about the *OA* (5'). Express the result as a Cartesian vector.

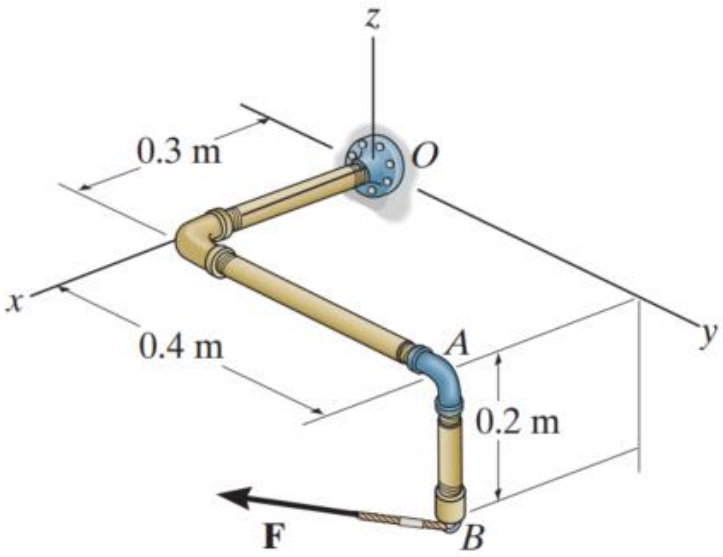

Figure 1

2. Replace the force system acting on the post shown in Figure 2 by a resultant force, and specify where its line of action intersects the post AB measured from point A. (15')

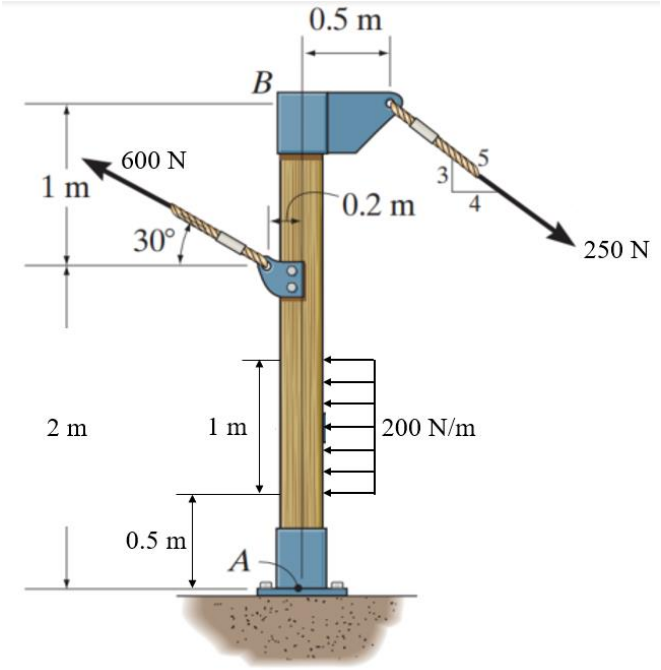

Figure 2

3. The bridge truss is subjected to the loading, as shown in Figure 3. Determine the force in members HI, HB, and BC, and state if the members are in tension or compression. (15')

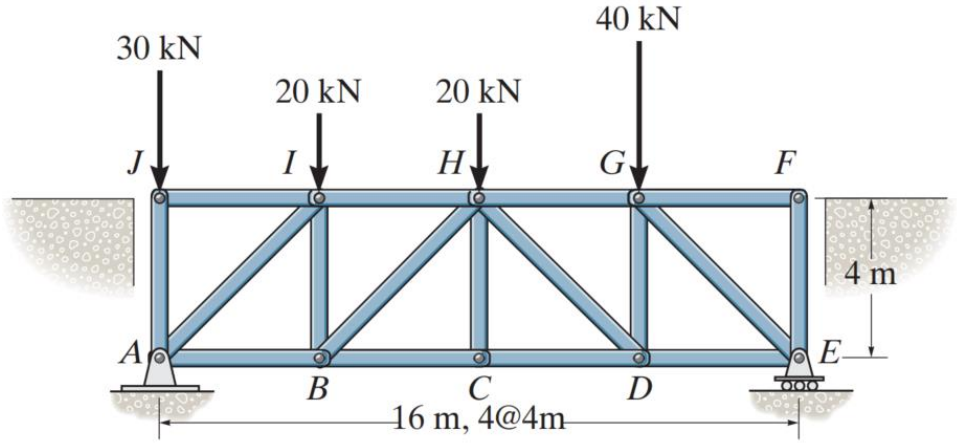

Figure 3

4. Use the principle of virtual work to determine the angle θ for equilibrium of the two-member linkage shown in Figure 4. Each member has a mass of 10 kg. (AB = BC = 0.6 m, g = 10 m/s^2) (15')

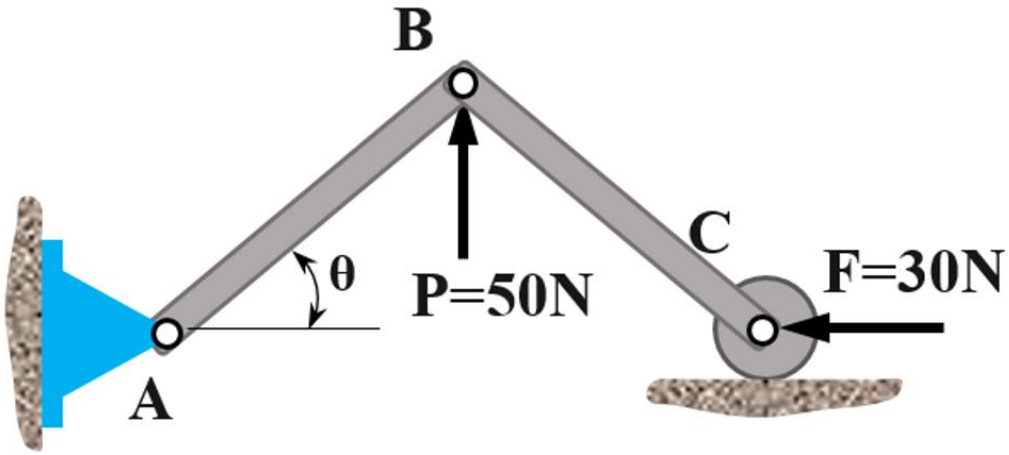

Figure 4

5. As shown in Figure 5, the mass of 500 kg is suspended from a trolley which moves along the crane rail from d = 1.8 m to d = 3 m. Determine the force along the pin-connected knee strut BC (short link) and the magnitude of force at pin A as a function of position d. Plot the magnitude of F_{BC} and the vertical component of the reaction at pin A versus d. (g = 10 m/s^2) (20')

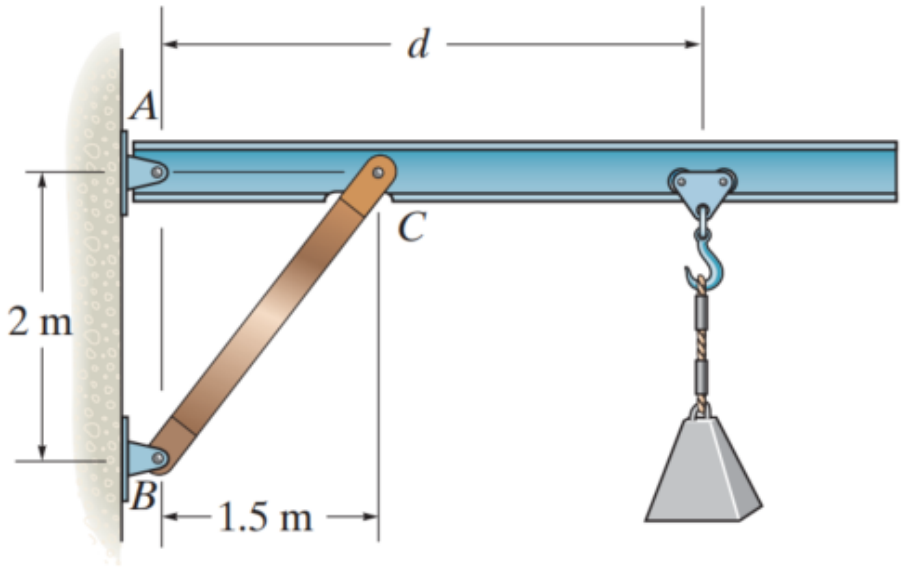

Figure 5

6. As shown in Figure 6, if the coefficients of static friction at contact points A and B are μ_s = 0.3 and μ_s' = 0.4 respectively, determine the smallest force P that will cause the 150-kg spool to have impending motion. (20')

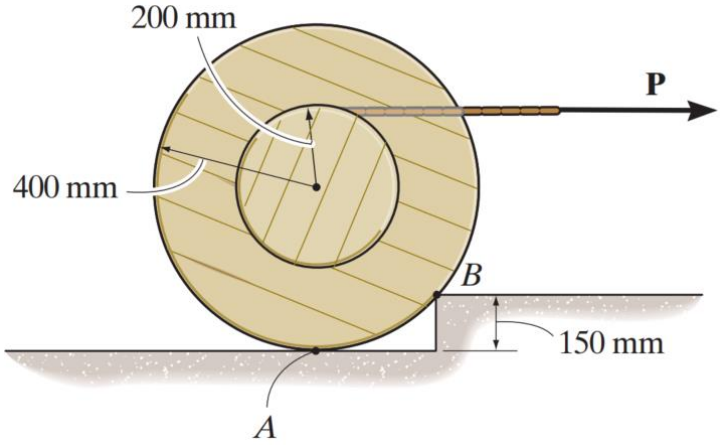

Figure 6