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

1. The bent rod ABDE is supported by ball-and-socket joints at A and E and by the cable DF, as shown in Figure 1. Force P = 100N is applied at C. The length unit for the dimensions dm. Determine: (a) the moment of force **P** about point E in the vector form (10'), (b) the magnitude of the moment of force **P** about line AE (5').

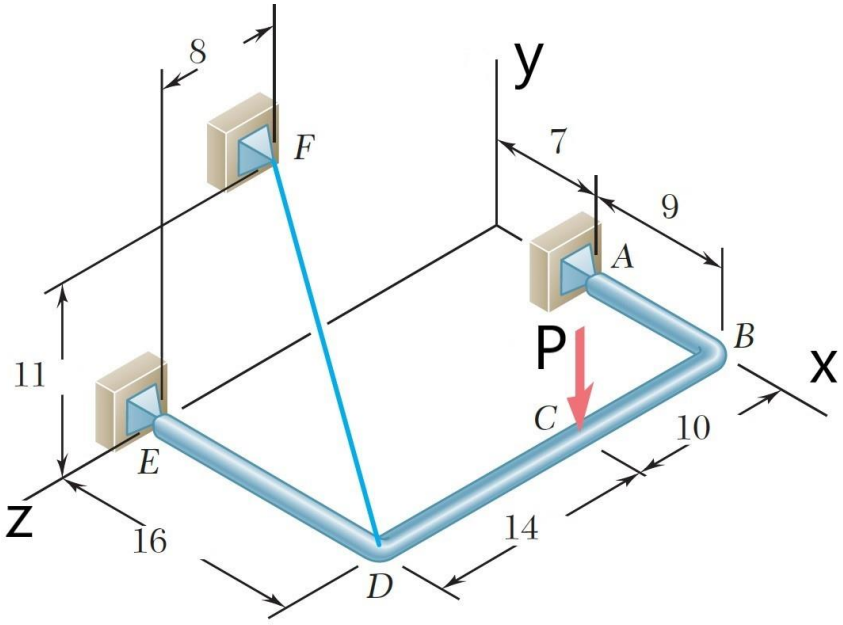

Figure 1

2. A concentrated force F = 1 kN, a distributed force, and a couple moment M = 3 kN·m act on the beam as shown in Figure 2, replace this system by an equivalent resultant force and couple moment acting at point A. Indicate the magnitude and direction of the resultant force. (15')

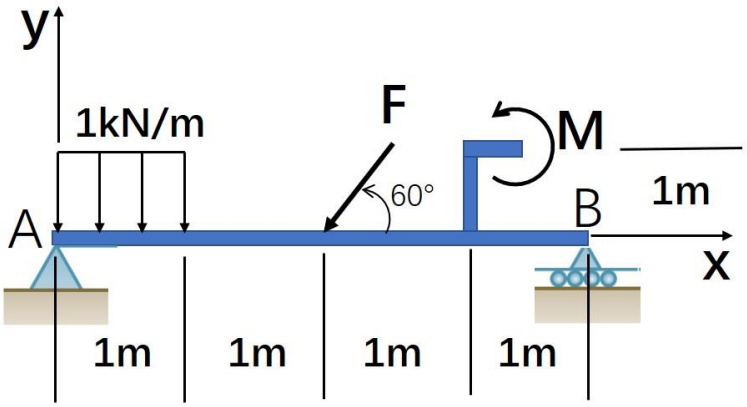

Figure 2

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

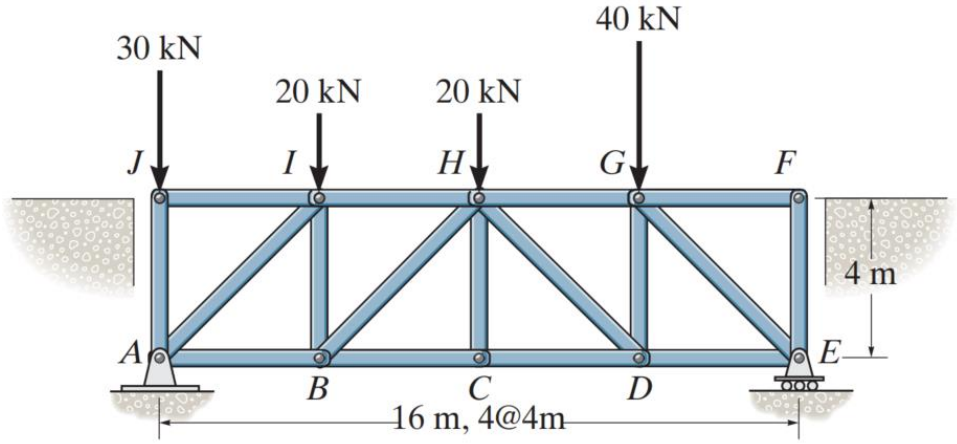

Figure 3

4. Using the principle of virtual work to determine the relation between $\mathbf{F_1}$ and $\mathbf{F_2}$ when the two-member linkage shown in Figure 4 is in static equilibrium. Joint C is pin constrained, A is rocker constrained, length of AB and BC is *L*. Neglect the weight of the members. (15')

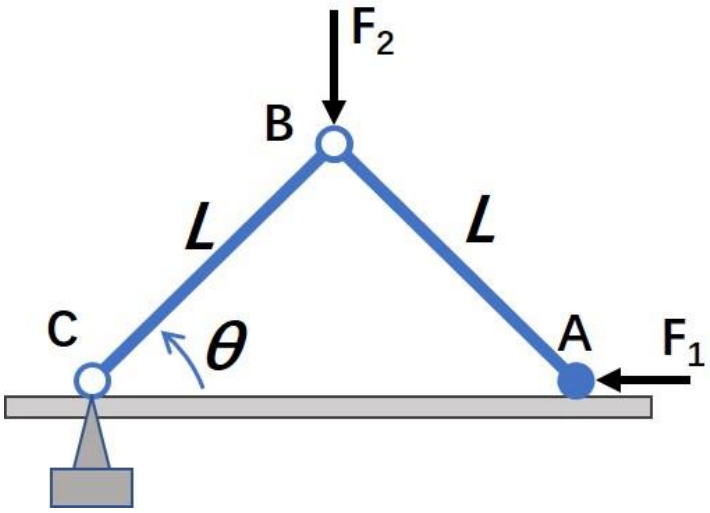

Figure 4

5. Determine the force in member BD (indicate whether the member is in tension or compression) and the components of the reaction at C, as shown in Figure 5. Note: convert unit of length to meter in your calculation. (20')

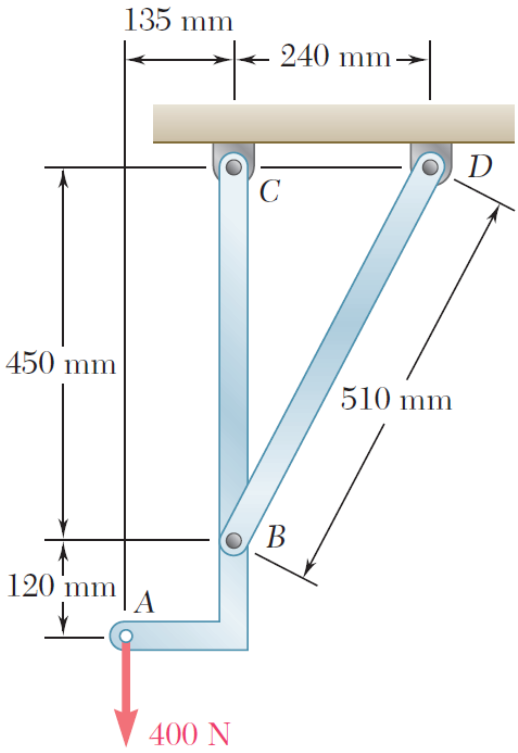

Figure 5

6. As shown in Figure 6, if the coefficients of static friction at contact points A and B are $\mu_s = 0.4$ and $\mu_s' = 0.2$ respectively, determine the smallest force P that will cause the 150-kg spool to have impending motion. (20')

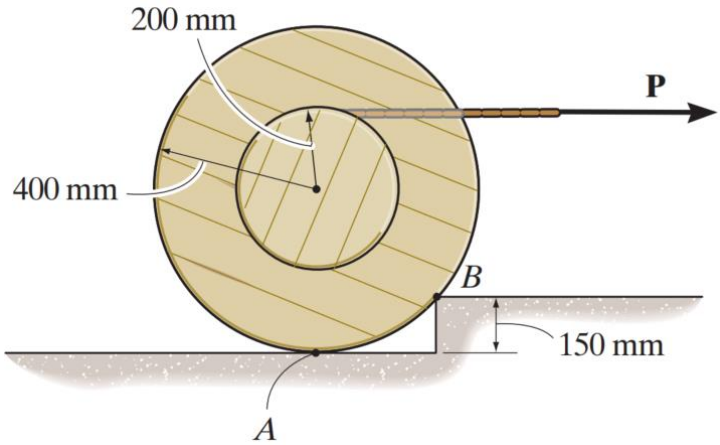

Figure 6