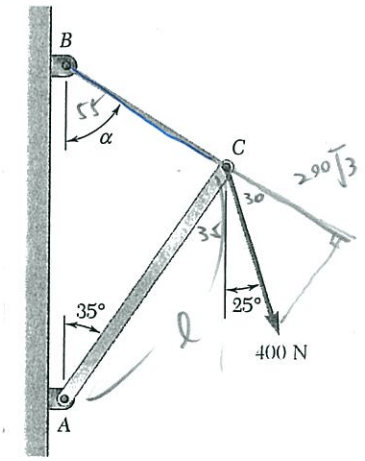
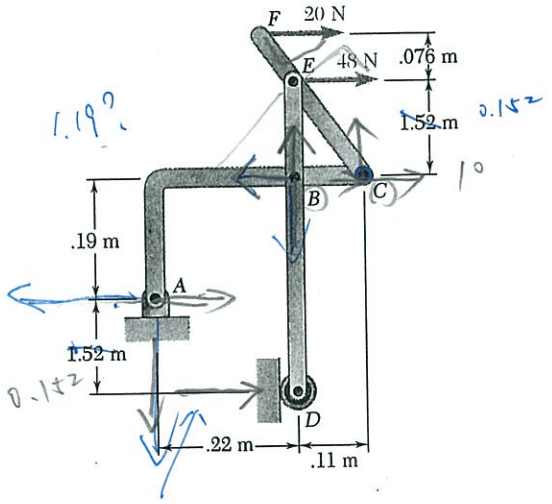
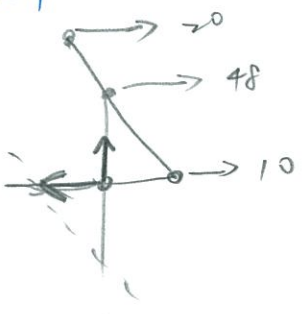
Ph. D. Qualified Examine Statics **Apr. 2008**

1. For the structure and loading as shown, determine (a) the value of α for which the tension in cable BC is as small as possible, (b) the corresponding value of the tension. (25%)

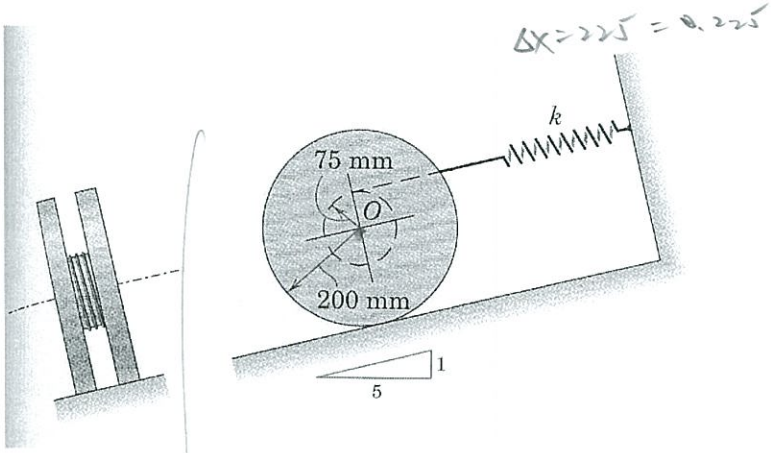


2. For the frame and loading shown, determine the components of the forces acting on member ABC at B and C. (25%)

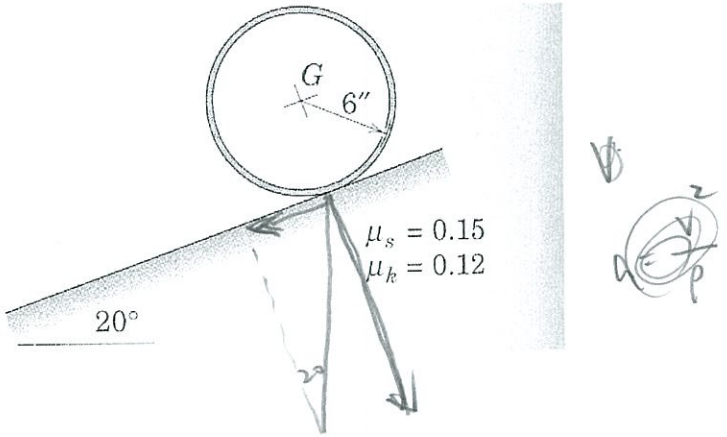




1. The 10-kg double wheel with radius of gyration of 125 mm about O is connected to the spring of stiffness k = 600 N/m by a cord which is wrapped securely around the inner hub. If the wheel is released from rest on the incline with the spring stretched 225 mm, determine the velocity v of its center O when O moves 0.1 m. The wheel rolls without sleeping.



2. A metal hoop with a radius r = 6 *in* is released from rest on the 20° incline. If the coefficient of static and kinetic friction are μ_s = 0.15 and μ_k = 0.12, determine (a) whether the hoop slips, (b) the angular acceleration of the hoop and (c) the time for the hoop to move a distance of 10 ft down the incline.



Vibration Theory (962 Ph.D. Qualification)

To the following questions, please give the necessary statements, equations, drawings, or explanations, whatever you think that may enhance the understanding of your answers.

1. Please explain the difference between Impulse Response Function and Frequency Response Function. (Source: 王栢村，振動學，2001，頁 4-32)(10%)

2. In addition to the rugged design and small sizes of accelerometers, what are the important considerations in the design of accelerometers? (Source: 王栢村，振動學，2001，頁 3-40) (10%)

3. Explain or demonstrate how to obtain the modal equations of continuous systems. (Source: Meirovitch, L., *Principles and Techniques of Vibrations*, 1997, pp. 469-470, 483) (10%)

4. Explain how to obtain the complete vibration response of a linear time-invariant system subject to arbitrary excitations. (Source: Meirovitch, L., *Principles and Techniques of Vibrations*, 1997, pp.126-129) (10%)

5. We can use Assumed-Mode Summation method (or called Assumed-Modes Method) to discretize a distributed system. What is the Assumed-Mode Summation method and how to use it? Is there anything that we should be careful when using this method? (Source: Thomson, W. T. and Dahleh, M. D., *Theory of Vibration with Application*, 5th ed. 1998, pp. 216-218. Also, Meirovitch, L., *Principles and Techniques of Vibrations*, 1997, pp.542-543) (10%)