

WORCESTER POLYTECHNIC INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DESIGN OF MACHINE ELEMENTS

COURSE No.: ME-3320, C'2017
TEXT: *Machine Design. An Integrated Approach*, 5ed.
R. L. Norton, Prentice-Hall, NJ, 2014

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WEB PAGE: <http://users.wpi.edu/~cfurlong/me3320.html>
LECTURES: M, Tu, Th, F @ 9:00 AM, SL-105
SECTION MTG: Th @ 9:00 AM, HL-230
DATE: 12 January 2017

TA: N/A

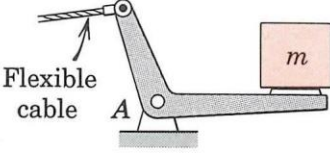
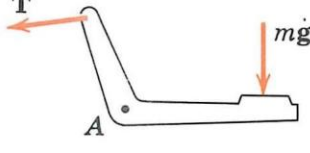
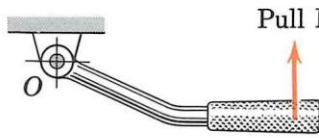
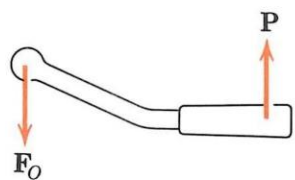
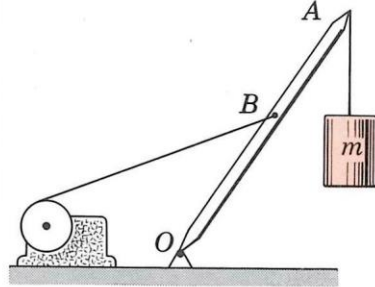
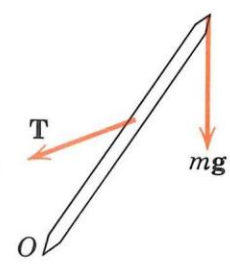
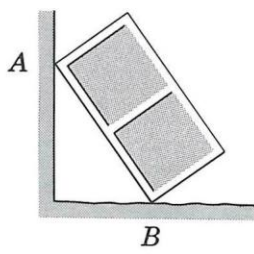
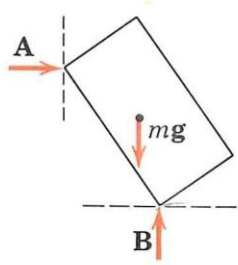
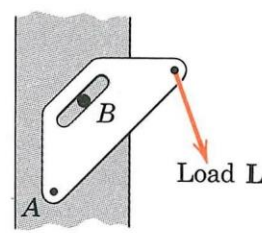
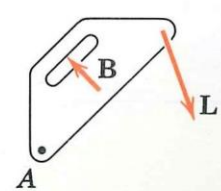
NOTE: In all your work, state explicitly every assumption and/or approximation made, explain every procedure, and justify its use. Dimensional analyses are absolutely necessary. All results must be expressed in appropriate units. PLEASE, ALWAYS SHOW ALL WORK, while writing your results only on one side of the sheet(s) of paper; start each problem on a new sheet.

Problem 1.9. For the configurations depicted in page two (2), the body to be isolated is shown in the left-hand diagram and an *incomplete* free-body diagram (FBD) of the isolated body is shown on the right. Add whatever forces/moments are necessary in each case to define a complete FBD. The weights of the bodies are negligible unless otherwise indicated. Dimensions and numerical values are omitted for simplicity.

Problem 1.10. For the configurations depicted in page three (3), draw a complete and correct free-body diagram (FBD) of each of the bodies designated in the statements. The weights of the bodies are significant only if the mass is specified. All forces/moments, known and unknown, should be labeled. (*Note:* the sense of some reaction components cannot always be determined without numerical calculations.)

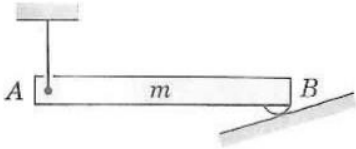
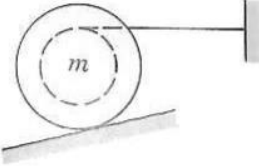
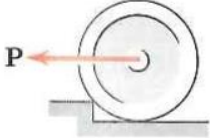
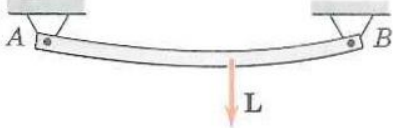
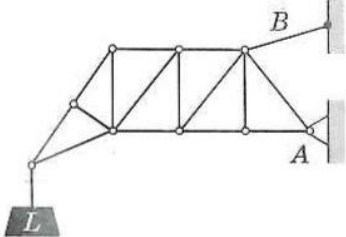
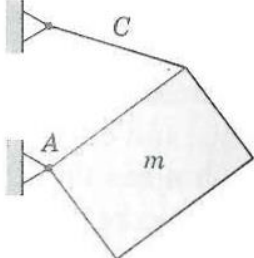
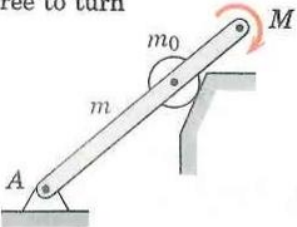
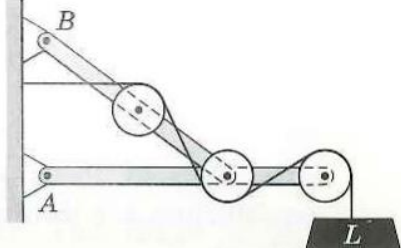
Problem 1.9.

Name: _____

	Body	Incomplete FBD
1. Bell crank supporting mass m with pin support at A		
2. Control lever applying torque to shaft at O		
3. Boom OA , of negligible mass compared with mass m . Boom hinged at O and supported by hoisting cable at B .		
4. Uniform crate of mass m leaning against smooth vertical wall and supported on a rough horizontal surface		
5. Loaded bracket supported by pin connection at A and fixed pin in smooth slot at B		

Problem 1.10.

Name: _____

<p>1. Uniform horizontal bar of mass m suspended by vertical cable at A and supported by rough inclined surface at B</p> 	<p>5. Uniform grooved wheel of mass m supported by a rough surface and by action of horizontal cable</p> 
<p>2. Wheel of mass m on verge of being rolled over curbing by pull P</p> 	<p>6. Bar, initially horizontal but deflected under load L. Pinned to rigid support at each end</p> 
<p>3. Loaded truss supported by pin joint at A and by cable at B</p> 	<p>7. Uniform heavy plate of mass m supported in vertical plane by cable C and hinge A</p> 
<p>4. Uniform bar of mass m and roller of mass m_0 taken together. Subjected to couple M and supported as shown. Roller is free to turn</p> 	<p>8. Entire frame, pulleys, and contacting cable to be isolated as a single unit</p> 

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