

Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

ME 323 MIDTERM # 1
SPRING SEMESTER 2014

Time allowed: 1 hour

Instructions

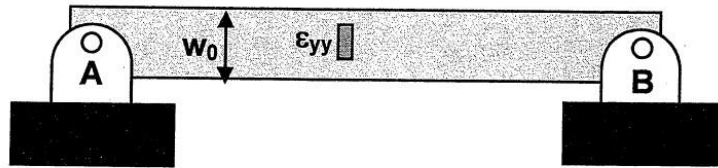
1. Begin each problem in the space provided on the examination sheets. If additional space is required, use the yellow paper provided. Work on one side of each sheet only, with only one problem on a sheet.
2. Each problem is of equal value.
3. To obtain maximum credit for a problem, you must present your solution clearly. Accordingly:
 - a. Identify coordinate systems
 - b. Sketch free body diagrams
 - c. State units explicitly
 - d. Clarify your approach to the problem including assumptions
4. If your solution cannot be followed, it will be assumed that it is in error.
5. When handing in the test, make sure that ALL SHEETS are in the correct sequential order. Remove the staple and restaple, if necessary.

Prob. 1	_____
Prob. 2	_____
Prob. 3	_____
Total	_____

Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 1

A rectangular aluminum bar ($w_0 = 1.0 \text{ in}$, $\alpha = 12.3 \times 10^{-6} / ^\circ F$, $\nu = 0.35$) is pinned at A and B with zero initial stress. Then it is subject to a change in temperature ΔT . The following strain is measured by the strain gauge as shown below: $\epsilon_{yy} = -187 \times 10^{-6}$. Neglect gravitational force. Find ΔT .



Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 1

Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

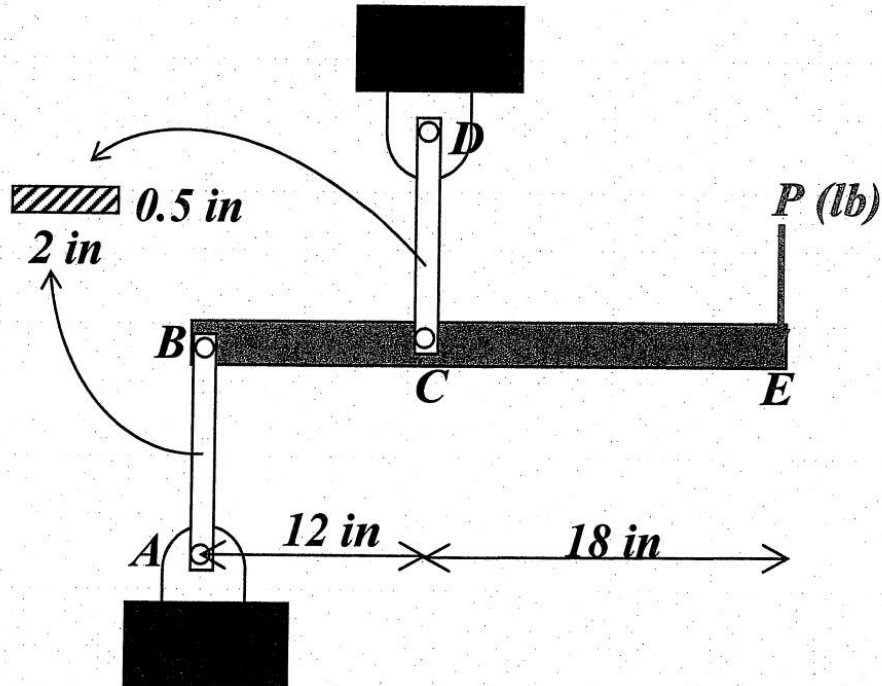
Problem 1

Name: _____, _____
(Print) (Last) (First)

Instructor: Raman Koslowski
(Circle one)

Problem 2

Each of the steel links AB and CD is connected to a support and to member BCE by 1-in. diameter steel pins acting in single shear. Knowing that the ultimate shearing stress is 30 ksi for the steel used in the pins and that the ultimate normal stress is 70 ksi for the steel used in the links, determine the allowable load P if an overall factor of safety of 3.0 is desired. The pins are in single shear.



Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 2

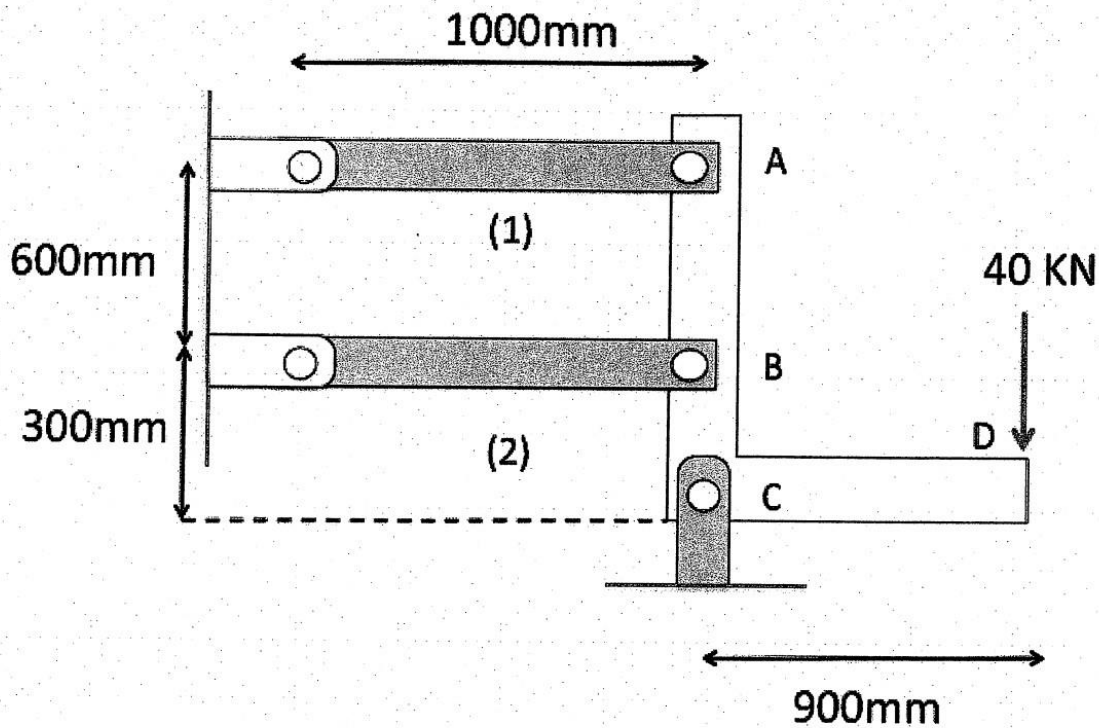
Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 2

Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 3

The pin-connected structure shown below consists of a rigid bracket ABCD and two axial members. Bar (1) and (2) are made of steel ($E=200\text{GPa}$, $\alpha=12 \times 10^{-6}/^\circ\text{C}$) with cross section $A=400\text{mm}^2$. The bars are unstressed when the structure is assembled. After a load $P = 40 \text{ kN}$ is applied and the temperature is increased by 20°C , calculate the stresses in bars (1) and (2).



Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 3

Name: _____, _____ Instructor: Raman Koslowski
(Print) (Last) (First) (Circle one)

Problem 3