## Practice Problems – Short Documentation (16 points) For these 4 problems, the Given, Find, and Solution are the only required documentation.

1. A thin plate forms a right angle at Q. When deformed point Q moves to the right by 0.8 mm and up by 1.3 mm to the new position Q’. Distances shown are: a = 225 mm, b = 455 mm, and d = 319.96 mm. Calculate the following after deformation:
   1. Shear strain at corner Q’
   2. Shear strain at R.



1. A thin plate (initially square with a = 800 mm) is deformed to the shape in the dashed line shown in the figure below where b = 85 mm, and C = 960 mm. Determine the following after deformation:
   1. Shear strain at P
   2. Shear strain at Q

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1. The figure below represents two polymers inside a rigid channel. As shown, when at a temperature of 60°F the dimensions are: L1 = 40 in, L2 = 24 in, and a = 0.125 in. The coefficients of thermal expansion for materials are α1 = 47 x 10-6 1/°F, and α2 = 66 x 10-6 1/°F. Assuming the rigid channel does not change shape as temperature changes, calculate the temperature [°F] at which the two polymers will touch one another.

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1. The device pictured below can be used to measure temperature change. The initial dimensions are: a = 25 mm, b = 90 mm, L1 = 180 mm, and the coefficients of thermal expansion for material (1) is α1 = 23.0 x 10-6 1/°C, and the pointer BD is initially vertical. Calculate the displacement of the pointer tip D if the ambient temperature increases by 35 °C. Assume that the thermal strain in the pointer BD is negligible and all thermal strain is manifest in material (1).



## Preparation for Next Class Period (6 points)

Note: Write down enough to show that you’ve done the following things to prepare for our next class session. This part of your homework can all be on a single page. It can be typed up, hand-written, or a combination of both. Put this at the end of your homework packet.

1. Review MM Module M3.1 about the tension test.
   1. What is the name of the device that measures the elongation of the specimen? And how small of a distance can they detect?
   2. What two measurements are taking during the tensile test?
   3. What does the measurement of ductility tell you about the material?
   4. What variables are shown on the horizontal and vertical axis on a stress-strain curve?
2. Review MM Module M3.2 about the stress-strain diagram. Describe the following:
   1. Proportional Limit (what it represents, how to find it, and appropriate units)
   2. Elastic Modulus (what it represents, how to find it, and appropriate units)
   3. What are three names for permanent strain left in a deformed specimen?
   4. Yield Strength
   5. Ultimate Strength
   6. What are the difference between engineering stress and true stress?
3. TB Reading sections 3.1 and 3.2.
   1. Write down any concepts you find confusing or want to discuss during next class