## Practice Problems – Short Documentation (12 points)For these 4 problems, the Given, Find, and Solution are the only required documentation.

1. A bar of aluminum alloy (E = 70 GPa, ν = 0.33, α = 23.0 x 10-6 1/°C) initially has initial dimensions of d = 260 mm, L = 4.5 m, and a cross-sectional area of A = 6500 mm2. Load P is applied, and the temperature of the bar is increased by ΔT by 56 °C you find the longitudinal strain in the bar is 2,950 με. Calculate the following:
	1. Magnitude of the load P
	2. Change in length Δd (due to combination of thermal strain and load P)



1. The rigid plate in the figure below is supported by bar (1), and a double shear connection at B. Bar (1) has a length L = 60 in, a cross-sectional area A = 0.47 in2, and elastic modulus E = 10 Mpsi, and coefficient of thermal expansion α = 13 x 10-6 1/°F. The pin at B has a diameter of 0.438 in. The plate has dimensions of a = 12 in, b = 20 in, and a thickness of 0.75 in. The total strain in bar (1) after load P is applied and the assembly has decreased by 30 °F is εtotal = 570 με. Calculate the following:
	1. Magnitude of load P
	2. Average shear stress in pin B



1. The figures below a square (with a = 40 mm) drawn on a rectangular bar prior to loading. Once a uniform normal stress of σ = -54 MPa is applied the square shape turns in to a rhombus with dimensions of b = 56.88 mm and c = 55.61 mm. Calculate Young’s Modulus for this material, assuming that the materials behaves elastically with the applied stress.



## 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. TB Reading sections 4.1 through 4.5.
	1. What are several types of design loads to consider?
	2. What is a safety factor? How is it used to calculate safe loads and safe stresses?
	3. From section 4.5, write out the short definitions for:
		1. Resistance (R\*)
		2. Service Load Effect (Q\*)
		3. Resistance Factor (φ)
		4. Load Factor (γi)
		5. Nominal Component Resistance (Rn)
		6. Nominal Service Load Effects (Qni)
	4. Write down any concepts you find confusing or want to discuss during next class
2. Review MM Modules 4.1 through 4.3. You can do the “Try One” problems, but don’t need to turn in any work for these.