Name _____

Unified Quiz FM5
December 3 2008

<u>M - PORTION</u>

- Put your name on each page of the exam.
- Read all questions carefully.
- Do all work on that question on the page(s) provided. Use back of the page(s) if necessary.
- Show all your work, especially intermediate results. Partial credit <u>cannot</u> be given without intermediate results.
- Show the logical path of your work. Explain <u>clearly</u> your reasoning and what you are doing. *In some cases, the reasoning is worth as much (or more) than the final answers*.
- Please be neat. It will be easier to identify correct or partially correct responses when the response is neat.
- Be sure to show the appropriate units throughout. Answers are not correct without the units.
- Report significant digits only.
- Box your final answers.
- ***Calculators are allowed.***
- ***Print-outs of Handouts "HO-M-8" and "HO-M-9" along with 2 sides of pages of handwritten material are allowed.***

EXAM SCORING

#1M (1/3)	
#2M (2/3)	
FINAL SCORE	

PROBLEM #1M (1/3)

A rectangular piece of unidirectional composite material is loaded in a state of plane stress with a pure shear of magnitude τ. The fibers of the material are aligned at a 30° angle with respect to the axis system in which the shear stress acts. There is one strain gage placed along the direction of the fibers and this reads A. A second strain gage is placed perpendicular to the direction of the fibers and reads B.
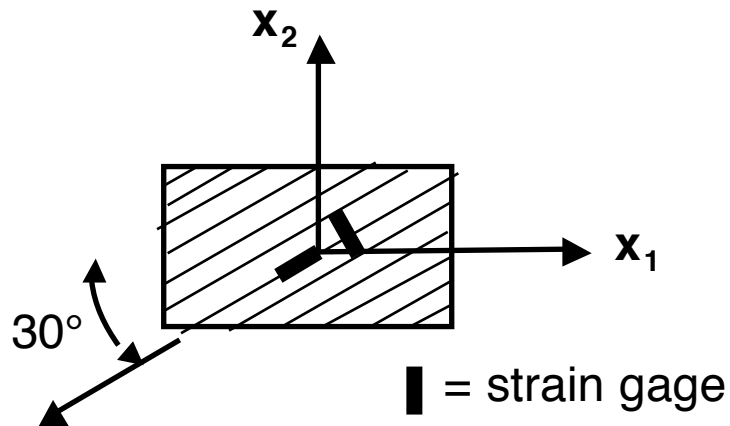
Is it possible to find a transformed axis system in the x_1 - x_2 plane such that the slab is loaded only by normal stresses, σ_{11} and σ_{22}? If not, describe why not. If yes, describe why, determine the angle to the transformed axis system, and determine the relative values of the normal stresses. **Clearly explain your reasoning.**

PROBLEM #1M (continued)

PROBLEM #2M (2/3)

A unidirectional composite ply has the following elastic constants:

$E_1 = 24$ Msi $\qquad\qquad$ $\nu_{12} = 0.24$ $\qquad\qquad$ $G_{12} = 6.0$ Msi

$E_2 = 3.0$ Msi $\qquad\qquad$ $\nu_{21} = 0.03$

These are referenced with the x_1 direction along the fibers and the x_2 direction perpendicular to the fibers. The unidirectional ply is loaded by a stress of 20 ksi at an angle 15° off the fiber direction as pictured. Strain gages are placed on the surface of the ply parallel and perpendicular to the fiber direction (also shown).

$\boldsymbol{\sigma}$

15°

▮ = strain gage
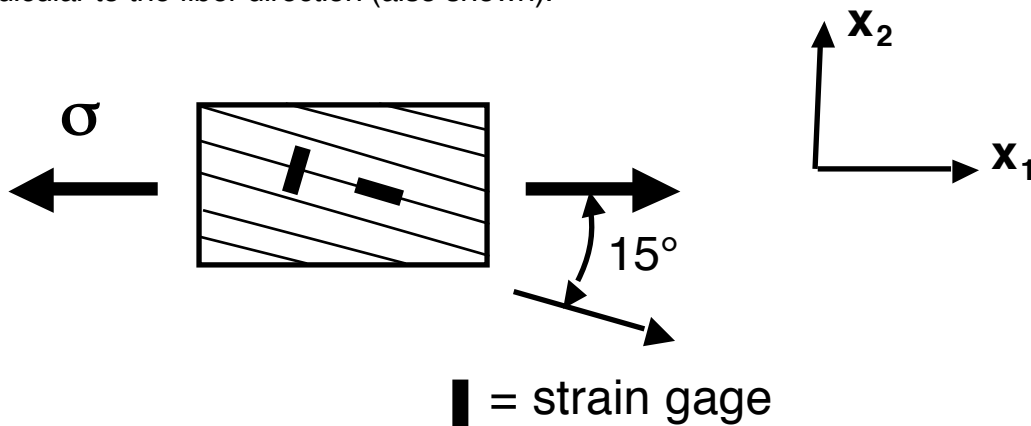
Can the strain readings be determined? If so, do so. If not, clearly explain why not, using equations as appropriate.

PROBLEM #2M (continued)

PROBLEM #2M (continued)