Homework No. 4

Due Date: May 21 (Wed) 6:30 PM

1.

Consider the following coupon test specimens 2" wide, made of the following layups of AS4/3501-6 plies. The ply thicknesses are all 0.005", with fiber fractions of 60%.

$[0/90]_s$ $[90/0]_s$ $[\pm 45]_s$

The coupons are subjected to a prescribed bending moment, $M_x = 100$ lb-in/in.

(a) Determine the D matrix for each layup
(b) Determine the ply stresses in the laminate axes $\tilde{\sigma}$
(c) Sketch the above stress distributions versus z
(d) Determine the ply stresses in the ply axes $\underset{\sim}{\sigma}$
(e) Determine the corresponding curvature κ_x, and compare curvatures and maximun stresses for the three laminates

2.

Given a square flat plate of side length a, subjected to a uniform loading p_o (lbs/in^2), and simply supported on all four edges. The plate is a $[0_2/90]_s$ cross-ply laminate made of AS4/3501-6 material.

(a) Determine all bending stiffnesses D_{ij} for this laminate.

(b) Using a four term approximation,

$$w = \sum_{m=1,3} \sum_{n=1,3} a_{mn} \sin m\pi x/a \sin n\pi y/a$$

determine the nondimensional deflection, $w D_{11}/p_o a^4$ at the center of this plate.

(c) Determine the nondimensionsal moments $M_x/p_o a^2$, $M_y/p_o a^2$, and $M_{xy}/p_o a^2$ at the center of the plate.