ME500/AA535 Homework Set #5 Due Monday 18 May

Note: Use program SPORTHO in all of the following problems.

A composite pre-preg system with the properties listed below is used to produce a rectangular 500mm x 500mm graphite-epoxy panel with stacking sequence $[0_4 / 90_4]_s$:

 $E_{11} = 170GPa$ $E_{22} = 10GPa$ $G_{12} = 13GPa$ $v_{12} = 0.30$ $\alpha_{11} = -0.9 \mu m/m - °C$ $\alpha_{22} = 27.0 \mu m/m - °C$ ply thickness = 0.125 mm $m = -0.9 \mu m/m - °C$ $\alpha_{22} = 27.0 \mu m/m - °C$

The panel is subjected to a uniform transverse pressure and simple supports of Type S4.

<u>Problem 1</u>: Suppose the plate is subjected to a constant and uniform transverse load q_o and biaxial in-plane loads of equal magnitude ($N_{xx} = N_{yy}$). Plot the maximum out-ofplane displacement induced if q = 25kPa and $0 \le N_{xx} = N_{yy} \le 30kN/m$.

<u>Problem 2</u>: Suppose the plate is subjected to a constant and uniform transverse load q_o and a uniaxial in-plane load, $N_{xx} \neq 0$, $N_{yy} = 0$ Plot the maximum out-of-plane displacement induced if q = 25kPa and $0 \le N_{xx} \le 30kN/m$.

<u>Problem 3</u>: Suppose the plate is subjected to a constant and uniform transverse load q_o and a uniaxial in-plane load, $N_{xx} = 0$, $N_{yy} \neq 0$ Plot the maximum transverse displacement induced if q = 25kPa and $0 \le N_{yy} \le 30kN/m$. (Did the results from Problems 2 and 3 to differ? Provide a brief discussion.)

<u>Problem 4:</u> Note that the total transverse load applied to the plate in problems 1 through 3 is $P = a \ge b = 6250 \ N$. Compare the maximum transverse displacement if $N_{xx} = N_{yy} = 30kN/m$ and:

(a)) a transverse load P = 6250 N is uniformly applied over the entire plate

(b) a transverse load P = 6250 N is uniformly applied over a central region of the plate with dimensions $a_i = a/2$, $b_i = b/2$

(c) a transverse point load P = 6250 N is applied at the center of the plate.