

Chapter 9 Special Problem

- (a) Using program CLT and the properties for graphite-epoxy listed in Table 3.1, confirm that the effective compliance terms listed in Table 9.2 for a $[0/90]_{2s}$ laminate are correct.
- (b) Calculate the principal roots for the characteristic equation for a $[0/90]_{2s}$ laminate “by hand”, using the exact solution discussed during class and listed below:

$$s_{1,2} = \pm \sqrt{\frac{-b + \sqrt{b^2 - 4dc}}{2d}} \quad s_{3,4} = \pm \sqrt{\frac{-b - \sqrt{b^2 - 4dc}}{2d}}$$

$$b = (2\bar{a}_{12} + \bar{a}_{66}) \quad c = \bar{a}_{22} \quad d = \bar{a}_{11}$$

Compare your answer to those listed in Table 9.2

- (c) Consider a $[0/90]_{2s}$ laminate with a 20 mm diameter circular hole, subjected to stress resultants $N_{xx} = 150 \text{ kN/m}$, $N_{yy} = 100 \text{ kN/m}$. Calculate the effective stresses induced at the point $x = 0$, $y = 10\text{mm}$ “by hand” (use a calculator or software package such as Maple, Mathematica, Matlab, EXCEL, etc, as needed). Compare your results with those predicted by program HOLES.