Ansys Project

The particular cross-ply laminate to be examined has three layers, so is symmetric about its middle surface. Thus, no coupling exists between bending and extension. Under the condition N_x=N and all other loads and moments are zero, the stresses in the (symmetric) outer layers are identical. One outer layer is called the 1-layer and has fibers in the x-direction (see Figure). The inner layer is called the 2-layer and has fibers in the y-direction. The other outer layer is the 3-layer, but because of symmetry there is no need to refer to it. The cross-ply ratio, M, is .2, so the thickness of the inner layer is ten times that of each of the outer layers (actually, the inner 'layer' is ten like-oriented laminae). Each lamina is .005 in (.1270 mm) thick, so the total laminate thickness is .060 in (1.524 mm). (Read chapter 4 in our textbook)

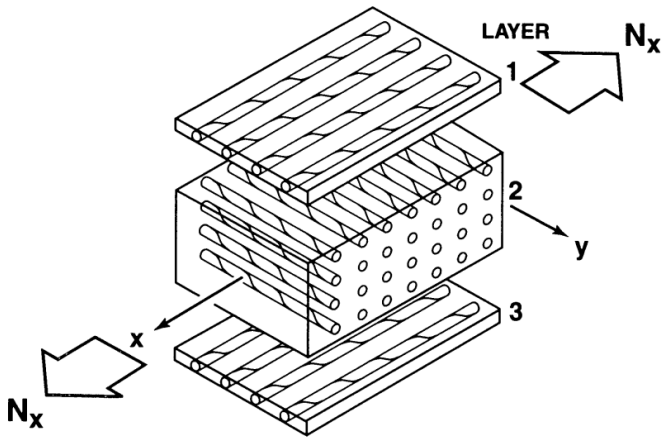

Figure 4-39 Unbonded View of a Three-Layered M = .2 Cross-Ply Laminate under Tensile Loading

The properties of the example E-glass-epoxy lamina are

$E_1 = 7.8 \times 10^6$ psi (53.78 GPa) $X_t = X_c = 150$ ksi (1035 MPa)

$E_2 = 2.6 \times 10^6$ psi (17.93 GPa) $Y_t = 4$ ksi (27.6 MPa)

$\nu_{12} = .25$ $Y_c = 20$ ksi (138 MPa) (4.112)

$G_{12} = 1.25 \times 10^6$ psi (8.62 GPa) $S = 6$ ksi (41.4 MPa)

$\alpha_1 = 3.5 \times 10^{-6}$/°F $(6.3 \times 10^{-6}$/°C) $\alpha_2 = 11.4 \times 10^{-6}$/°F $(20.52 \times 10^{-6}$/°C)

Apply Tsai-Hill criterion to find the magnitude of Nx to cause failure if the laminate is cured at room temperature, $\Delta T = 0$. Indicate the at which layer failure occurs first and in which direction fiber or matrix?z

You have to submit as a technical report and explain your work in Ansys using computer as an oral presentation .

You can submit and present your work as quick as possible. Last day for presentation is 9th of september.