

지능재료 및 설계 과제물 4번

제출기한: 5월 18일 (금)

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%.

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

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

- Determine the D matrix for each layup
- Determine the ply stresses in the laminate axes $\bar{\sigma}$
- Sketch the above stress distributions versus z
- Determine the ply stresses in the ply axes σ
- Determine the corresponding curvature κ_x , and compare curvatures and maximum stresses for the three laminates

2.

Given a square flat plate of side length a , subjected to a uniform loading p_0 (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.

- Determine all bending stiffnesses D_{ij} for this laminate.
- 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, $w D_{11}/p_0 a^4$ at the center of this plate.

- Determine the nondimensional moments $M_x/p_0 a^2$, $M_y/p_0 a^2$, and $M_{xy}/p_0 a^2$ at the center of the plate.