Assignment 3

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment. Due on 2018-09-05, 23:59 IST.

1) Which of the following laminates has a zero [B] matrix? 1 point

- [0,90].
- [0,45].
- [0,45,45,0].
- [0,45, -45].

No, the answer is incorrect.
Score: 0
Accepted Answers:
[0,45,45,0].

2) Which one of the following assumptions does not relate to the classical lamination theory? 1 point

- Each lamina is orthotropic and in a state of plane stress.
- Thickness of laminate is equal to sum of thickness of all individual layers.
- Each lamina is elastic.
- Slip may occur between lamina interfaces.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Slip may occur between lamina interfaces.

3) The extensional stiffness matrix [A] for a laminate will not change if 1 point

- stacking sequence is changed.
- angle of plies is changed.
4) Mid-plane curvatures for a laminate are zero according to classical laminate theory if the laminate is symmetric and is subjected to only in-plane forces. D_{16} = D_{26} = 0

No, the answer is incorrect.
Score: 0
Accepted Answers:
laminate is symmetric and is subjected to only in-plane forces

5) Which of the following laminates will not undergo bending when subjected to thermal loads?

- [0,45, -45].
- [0,45,90,90,45,0].
- [0.30, -45].
- [0,45,90,45, -45].

No, the answer is incorrect.
Score: 0
Accepted Answers:
[0,45,90,90,45,0].

6) (Note: Problem 6 to 8 have same data as given below)
A balanced cross-ply laminate possessing mid-plane symmetry is made up of laminae having the following properties:

\[
E_L = 15 \text{ GPa}, \quad G_{LT} = 3 \text{ GPa}, \quad E_T = 6 \text{ GPa}, \quad \nu_{LT} = 0.5
\]

The laminate is subjected to a normal axial stress of 15 MPa and a shear stress of 1.0 MPa. (Assumption: Laminate has unit thickness and unit cross section)
Find mid-plane strains for the laminate.

\[
\begin{bmatrix}
\varepsilon_x \\
\varepsilon_y \\
\gamma_{xy}
\end{bmatrix} = \begin{bmatrix}
0.0014 \\
-0.004 \\
0.00033
\end{bmatrix}
\]

\[
\begin{bmatrix}
\varepsilon_x \\
\varepsilon_y \\
\gamma_{xy}
\end{bmatrix} = \begin{bmatrix}
0.00014 \\
-0.0004 \\
0.00033
\end{bmatrix}
\]

\[
\begin{bmatrix}
\varepsilon_x \\
\varepsilon_y \\
\gamma_{xy}
\end{bmatrix} = \begin{bmatrix}
0.0014 \\
-0.0004 \\
0.00033
\end{bmatrix}
\]
7) Calculate normal and shear stresses in 90° plies.

\[
\begin{bmatrix}
\sigma_x \\
\sigma_y \\
\tau_{xy}
\end{bmatrix} = \begin{bmatrix} 8 \\ 2 \\ 1 \end{bmatrix} \text{ MPa}
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
\begin{bmatrix}
\sigma_x \\
\sigma_y \\
\tau_{xy}
\end{bmatrix} = \begin{bmatrix} 8 \\ 2 \\ 1 \end{bmatrix} \text{ MPa}
\]

8) While solving Problem 7, we assumed that strains produced in entire laminate is same as the mid plane strains. This assumption is valid as the ...........

No, the answer is incorrect.
Score: 0
Accepted Answers:
given laminate is balanced.
given laminate is cross ply.
given laminate is balanced cross-ply.
given laminate is balanced and is it subjected to in-plane stresses only.

9) A laminate has ply orientation \([45/0^-]s\) where each ply is 4 mm thick. Its individual layers has the following stiffness matrix.

\[
\begin{bmatrix} 30 & 1 & 0 \\
1 & 3 & 0 \\
0 & 0 & 1 \end{bmatrix} \text{ GPa}
\]

If \(N_x = N_y = 4000 \text{ N/mm}, N_{xy} = 0, M_x = 25,000 \text{ N.mm/mm},\) and \(M_{xy} = M_y = 0,\) calculate
mid-plane strains produced in laminate.

\[
\begin{bmatrix}
\varepsilon_x^0 \\
\varepsilon_y^0 \\
\gamma_{xy}^0
\end{bmatrix} = \begin{bmatrix} 14.61 \\ 80.35 \\ -77.69 \end{bmatrix} \times 10^{-3}
\]

No, the answer is incorrect.
Score: 0

Accepted Answers:

\[
\begin{bmatrix}
\varepsilon_x^0 \\
\varepsilon_y^0 \\
\gamma_{xy}^0
\end{bmatrix} = \begin{bmatrix} 14.61 \\ 80.35 \\ -77.69 \end{bmatrix} \times 10^{-3}
\]

10 Calculate plate curvatures produced in the laminate as described in Problem 9.

\[
\begin{bmatrix}
k_x \\
k_y \\
k_{xy}
\end{bmatrix} = \begin{bmatrix} 43.78 \\ -11.14 \\ 19.63 \end{bmatrix} \times 10^{-3} \text{ mm}^{-1}
\]

No, the answer is incorrect.
Score: 0
\[ \begin{bmatrix} k_x \\ k_y \\ k_{xy} \end{bmatrix} = \begin{bmatrix} 43.78 \\ -21.14 \\ -19.63 \end{bmatrix} \times 10^{-3} \text{mm}^{-1} \]