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Courses » Theory of Rectangular Plates - Part 1

Announcements **Course** Ask a Question Progress Mentor FAQ

Unit 3 - Week 1 : Basic Terminology, Equations and Methods

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Course outline

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Assignment 0: Basics

Week 1 : Basic Terminology, Equations and Methods

- Basic of Solid Mechanics
- Energy Principles
- Classification of Plate Theories and Some Basics
- Tutorial 1: Transformation of Tensors
- Quiz : Assignment 1

Week 2 : Derivation of Classical Plate Equations

Week 3 : Analytical Solution - Navier and Levy for Bending Case

Week 4 : Approximate Solution Techniques and 3D solution

Assignment 1

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) For carbon-epoxy composite Young's Modulus along longitudinal and transverse directions are $E_1 = 147GPa, E_2 = 10GPa$,shear modulus $G_{12} = 7GPa$ and poisson's ratio $\nu_{12} = 0.27$ then the compliance coefficients $(S_{11}, S_{12}, S_{22}, S_{66})$ in $(GPa)^{-1}$ will be *1 point*

- $(0.00794, -0.00223, 0.9091, 1.5152)$
- $(0.0068, -0.00183, 0.01, 0.1428)$
- $(0.0068, -0.00183, 0.1, 0.1428)$
- $(0.364, -0.15, 0.6031, 0.0152)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(0.0068, -0.00183, 0.1, 0.1428)$

2) The displacement field v is given in the following form $v(x, y, z) = v_0(x, y) - zw_{0,y}(x, y)$ .Expression for $\delta\epsilon_{yy}$ will be *1 point*

- $\delta\epsilon_{yy} = \delta v_{0,y} - z\delta w_{0,yy} + (\delta z)w_{0,yy}$
- $\delta\epsilon_{yy} = \delta v_{0,y} - z\delta w_{0,yy}$
- $\delta\epsilon_{yy} = \delta v_{0,y} - z\delta w_{0,y}$
- $\delta\epsilon_{yy} = \delta v_{0,yy} - z\delta w_{0,yy}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\delta\epsilon_{yy} = \delta v_{0,y} - z\delta w_{0,yy}$

3) Plane Lamina having $\sigma_x = 40MPa$,$\sigma_y = 10MPa$, $\tau_{xy} = 5MPa$. Calculate the transformed stresses σ_1 and σ_2 in MPa when the fiber angle is $\theta = 45^0$ to the x-axis *1 point*

- $(30, 20)$
- $(20, 30)$
- $(30, 10)$
- $(10, 30)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(30, 20)$

4) For a particular case of screw dislocation the displacements are given by $u = v = 0, w = \frac{b}{2\pi}\, tan^{-1}\, \frac{y}{2x}$ .The value of the strains $\epsilon_{xz}, \epsilon_{yz}$ are *1 point*

- $\frac{-b}{2\pi}\left(\frac{y}{x^2+4y^2}\right), \frac{b}{2\pi}\left(\frac{x}{4x^2+y^2}\right)$
- $\frac{-b}{2\pi}\left(\frac{y}{4x^2+y^2}\right), \frac{b}{\pi}\left(\frac{4x}{x^2+y^2}\right)$
- $\frac{-b}{2\pi}\left(\frac{y}{4x^2+y^2}\right), \frac{b}{2\pi}\left(\frac{x}{4x^2+y^2}\right)$
- $\frac{-b}{2\pi}\left(\frac{y}{4x^2+4y^2}\right), \frac{b}{\pi}\left(\frac{2x}{4x^2+y^2}\right)$

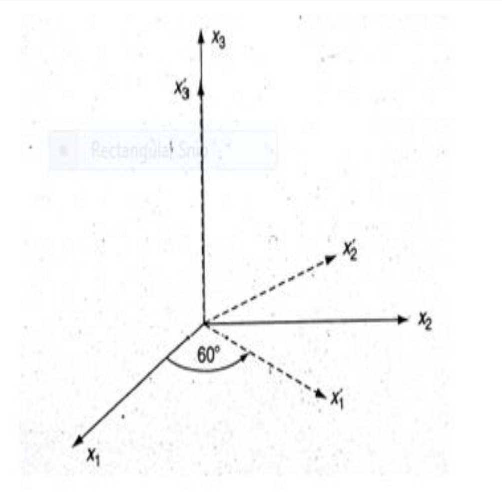
No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{-b}{2\pi}\left(\frac{y}{4x^2+y^2}\right), \frac{b}{2\pi}\left(\frac{x}{4x^2+y^2}\right)$

5) The components of a second-order tensor in a particular coordinate frame are given by *1 point*

$$a_{ij} = \begin{bmatrix} 2 & 0 & 3 \\ 0 & 1 & 3 \\ 4 & 2 & 1 \end{bmatrix}$$

Determine the components of each tensor in a new coordinate system found through a rotation of 60^0 about the x_3 axis



- $\begin{bmatrix} 1.24 & -0.433 & 4.098 \\ -0.433 & 1.749 & -2.464 \\ 4.098 & -1.098 & 1 \end{bmatrix}$
- $\begin{bmatrix} 1.24 & 0.433 & -4.098 \\ -0.433 & 1.749 & 2.464 \\ 4.098 & -1.098 & 1 \end{bmatrix}$
-

$$\begin{bmatrix} 1.24 & 0.433 & -4.098 \\ -0.433 & 1.749 & -1.098 \\ -3.732 & -2.464 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1.24 & -0.433 & 4.098 \\ -0.433 & 1.749 & -1.098 \\ 3.732 & -2.464 & 1 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 1.24 & -0.433 & 4.098 \\ -0.433 & 1.749 & -1.098 \\ 3.732 & -2.464 & 1 \end{bmatrix}$$

6) Consider a beam,clamped at both ends i.e $w = 0$ and $w_{,x} = 0$ at $x = 0$,and $w = 0$ and $w_{,x} = 0$ at $x = L$.It is subjected to uniformly distributed load acting downward,$q = q_0$.The equation of the beam is $EIw_{,xxxx} = q$.The deflection of the beam is given by **1 point**

$$\frac{1}{EI}\left[\frac{q_0x^4}{24} + \frac{q_0x^2L^2}{24} + \frac{q_0x^3L}{2L}\right]$$

$$\frac{1}{EI}\left[\frac{q_0x^4}{24} + \frac{q_0x^2L^2}{24} - \frac{q_0x^3L}{2L}\right]$$

$$\frac{1}{EI}\left[\frac{q_0x^4}{24} - \frac{q_0x^2L^2}{24} - \frac{q_0x^3L}{2L}\right]$$

None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
None of the above

7) For carbon-epoxy composite Young's modulus along the longitudinal and transverse direction are $E_1 = 147GPa, E_2 = 10GPa$ and shear modulus $G_{12} = 7GPa$ and $\nu_{12} = 0.27$,then the reduced stiffness coefficients $(Q_{11}, Q_{12}, Q_{22}, Q_{66})$ in (GPa) will be **1 point**

$(14.7, 27.03, 10.049, 7)$

$(147.732, 2.703, 10.049, 7)$

$(147.732, 2.703, 13.049, 7)$

$(14.7, 27.03, 13.049, 0.142)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(147.732, 2.703, 10.049, 7)$

8) A function is defined by $F(y, v) = f(y) + y^2v(y) - 2vv_{,y} + 2ycosv$ then the first variation of F will be **1 point**

$\delta F = y^2\delta v - 2\delta v v_{,y} - 2v\delta v_{,y} + 2ycosv\delta v$

$\delta F = 2y\delta v - 2\delta v v_{,y} - 2v\delta v_{,y} - 2ysinv\delta v$

$\delta F = y^2\delta v - 2\delta v v_{,yy} - 2v\delta v + 2ysinv\delta v$

$\delta F = y^2\delta v - 2\delta v v_{,y} - 2v\delta v_{,y} - 2ysinv\delta v$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\delta F = y^2\delta v - 2\delta v v_{,y} - 2v\delta v_{,y} - 2ysinv\delta v$

9) Consider the displacement fields $u(x,z,t) = u_0(x,t) + z\phi(x,t)$, $v(x,z,t) = 0$ and $w(x,z,t) = w_0(x,t)$ then the non-linear strain E_{xx} is given by *1 point*

$u_{0,x} + z\phi_{,x} + \frac{1}{2}\left[(u_{0,x})^2 + (w_{0,x})^2\right] + zu_{0,x}\phi_{,x} + \frac{z^2}{2}(\phi_{,x})^2$

$u_0 + z\phi + \frac{1}{2}\left[(u_{0,x})^2 + (w_{0,x})^2\right] + zu_{0,x}\phi_{,x} + \frac{z^2}{2}(\phi_{,x})$

$u_{0,x} + z\phi_{,x} + \left[(u_{0,x})^2 + (w_{0,x})^2\right] + zu_{0,x}\phi_{,x} + \frac{z^2}{2}(\phi_{,x})$

$u_{0,x} + z\phi_{,x} + \frac{1}{2}\left[(u_{0,xx})^2 + (w_{0,xx})^2\right] + zu_{0,x}\phi_{,x} + \frac{z^2}{4}(\phi_{,x})^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$u_{0,x} + z\phi_{,x} + \frac{1}{2}\left[(u_{0,x})^2 + (w_{0,x})^2\right] + zu_{0,x}\phi_{,x} + \frac{z^2}{2}(\phi_{,x})^2$

Previous Page End