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Courses » Theory of Rectangular Plates - Part 1

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

Unit 4 - Week 2 : Derivation of Classical Plate Equations

Assignment 2

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

1) Which of the following assumptions are correct according to Kirchoff's plate theory *1 point*
(i).Transverse normals rotate and does not remain perpendicular to middle surface after deformation
(ii). Transverse normals are inextensible.
(iii).Transverse normals before deformation remain straight after deformation
(iv). Transverse normals are extensible.

- (i,ii)
- (i,iv)
- (ii,iii)
- (iii,iv)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(ii,iii)

2) A plate is subjected to the load of the type $q(x,y) = q_0\,\frac{x}{a}\,sin\,\frac{ny\pi}{b}$ .The value of coefficient q_{mn} according to Navier's solution for $m = 1$ and $n = 1$ will be *1 point*

- $\frac{-2q_0}{\pi}$
- $\frac{4q_0}{\pi}$
- $\frac{q_0}{2\pi}$
- $\frac{2q_0}{\pi}$

No, the answer is incorrect.

$u_0 \neq 0, v_0 \neq 0, w_0 \neq 0, w_{0,y} \neq 0$

$u_0 = 0, v_0 = 0, w_0 = 0, w_{0,y} = 0$

$u_0 = 0, v_0 \neq 0, w_0 = 0, w_{0,y} \neq 0$

$u_0 \neq 0, v_0 = 0, w_0 \neq 0, w_{0,y} = 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$u_0 = 0, v_0 = 0, w_0 = 0, w_{0,y} = 0$

4) A plate subjected to the load of the type $q(x,y) = q_0 \frac{x^2y^2}{a^2b^2}$. The value of the coefficient q_{mn} according to the Navier's solution for $m = 2$ and $n = 2$ will be *1 point*

$\frac{-q_0}{\pi^2}$

$\frac{2q_0}{\pi^2}$

$\frac{-2q_0}{\pi^2}$

$\frac{q_0}{\pi^2}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{q_0}{\pi^2}$

5) Consider an orthotropic plate made up of Glass/Epoxy with the following material properties in the principal material coordinates $E_1 = 41GPa, E_2 = 10.4GPa, G_{12} = 4.3GPa, \nu_{12} = 0.28$ .If the thickness of the plate is 1mm.Then the value of $\frac{A_{11}+A_{66}}{A_{12}+A_{22}}$ is *1 point*

3.7

3.4

4.3

4.7

No, the answer is incorrect.
Score: 0

Accepted Answers:
3.4

6) Consider an orthotropic plate made of Kevlar-Epoxy with the following material properties in the principal material coordinates as $E_1 = 80GPa, E_2 = 5.5GPa, G_{12} = 2.2GPa, \nu_{12} = 0.34$. If the thickness of the plate is 1 mm then the value of $\frac{D_{66}}{D_{12}}$ will be *1 point*

2.3

3.2

1.175

11.75

No, the answer is incorrect.

Score: 0

Accepted Answers:
1.175

7) Consider an orthotropic plate made of carbon/epoxy with following material properties in the principal material coordinates $E_1 = 147GPa, E_2 = 10.3GPa, G_{12} = 7GPa, \nu_{12} = 0.27$ and the midplane strains are $\epsilon^0_{xx} = 0.3 * 10^{-3}, \epsilon^0_{yy} = -0.97 * 10^{-3}, \gamma^0_{xy} = 0$ .If the thickness of the plate is $2mm$.Then the value of the stress resultant in $kPa - m$ are *1 point*

$$\begin{bmatrix} 83.232 \\ -18.408 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 8.7265 \\ -19.292 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -19.292 \\ 87.2765 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 87.265 \\ 19.292 \\ 0 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 83.232 \\ -18.408 \\ 0 \end{bmatrix}$$

8) Consider an orthotropic plate made up of glass/epoxy with the following material properties in the principal material coordinates $E_1 = 41GPa, E_2 = 10.4GPa, G_{12} = 4.3GPa, \nu_{12} = 0.28$ and the curvature strains are given by $\epsilon^1_{xx} = 0.4 * 10^{-3}, \epsilon^1_{yy} = 0.85 * 10^{-3}, \gamma^1_{xy} = 0$ .If the thickkness of the plate is $1mm$ then the value of the moment resultants in Pam^3 are *1 point*

$$\begin{bmatrix} -1.604 \\ -0.8504 \\ 0 \end{bmatrix} * 10^{-3}$$

$$\begin{bmatrix} 16.04 \\ 8.504 \\ 0 \end{bmatrix} * 10^{-3}$$

$$\begin{bmatrix} 1.604 \\ 0.8504 \\ 0 \end{bmatrix} * 10^{-3}$$

$$\begin{bmatrix} 2.36 \\ 1.42 \\ 0 \end{bmatrix} * 10^{-3}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 1.604 \\ 0.8504 \\ 0 \end{bmatrix} * 10^{-3}$$

9) For the given displacement fields $u = u_0(x,y) + z\phi(x,y)$ $v = v_0(x,y) + z\psi(x,y)$ and $w = w_b(x,y) + w_s(x,y)$ which of the following is the correct expression for strain energy **_1 point_**

- $\delta U = \int_V [\sigma_{xx}\epsilon_{xx} + \sigma_{yy}\epsilon_{yy} + \sigma_{zz}\epsilon_{zz} + \tau_{xz}\gamma_{xz} + \tau_{yz}\gamma_{yz} + \tau_{xy}\gamma_{xy}]dV$
- $\delta U = \int_V [\sigma_{xx}\epsilon_{xx} + \sigma_{yy}\epsilon_{yy} + \sigma_{zz}\epsilon_{zz} + \tau_{xy}\gamma_{xy}]dV$
- $\delta U = \int_V [\sigma_{xx}\epsilon_{xx} + \sigma_{yy}\epsilon_{yy} + \tau_{xz}\gamma_{xz} + \tau_{yz}\gamma_{yz} + \tau_{xy}\gamma_{xy}]dV$
- $\delta U = \int_V [\sigma_{xx}\epsilon_{xx} + \sigma_{yy}\epsilon_{yy} + \tau_{xz}\gamma_{xz} + \tau_{yz}\gamma_{yz}]dV$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\delta U = \int_V [\sigma_{xx}\epsilon_{xx} + \sigma_{yy}\epsilon_{yy} + \tau_{xz}\gamma_{xz} + \tau_{yz}\gamma_{yz} + \tau_{xy}\gamma_{xy}]dV$

10)For the following displacement fields $u = u_0(x,y) + z\phi(x,y), v = v_0(x,y) + z\psi(x,y), w = w_b(x,y)$ the expression for kinetic energy is given by **_1 point_**

- $\int_\Omega [I_0(\dot{u}_0\delta\dot{u}_0 + \dot{v}_0\delta\dot{v}_0 + \dot{w}_b\delta\dot{w}_b) + I_1(\dot{\phi}\delta\dot{u}_0 + \dot{u}_0\delta\dot{\phi} + \dot{v}_0\delta\dot{\psi} + \dot{\psi}\delta\dot{v}_0) + I_2(\dot{\phi}\delta\dot{\phi} + \dot{\psi}\delta\dot{\psi})]d$
- $\int_\Omega [I_0(\dot{u}_0\delta\dot{u}_0 + \dot{v}_0\delta\dot{v}_0 + \dot{w}_b\delta\dot{w}_b) + I_1(\dot{u}_0\delta\dot{\phi} + \dot{v}_0\delta\dot{\psi} + \dot{\psi}\delta\dot{v}_0) + I_2(\dot{\phi}\delta\dot{\phi} + \dot{\psi}\delta\dot{\psi})]dxdy$
- $\int_\Omega [I_0(\dot{u}_0\delta\dot{u}_0 + \dot{v}_0\delta\dot{v}_0 + \dot{w}_b\delta\dot{w}_b) + I_1(\dot{\phi}\delta\dot{u}_0 + \dot{u}_0\delta\dot{\phi} + \dot{v}_0\delta\dot{\psi}) + I_2(\dot{\phi}\delta\dot{\phi} + \dot{\psi}\delta\dot{\psi})]dxdy$
- $\int_\Omega [I_0(\dot{u}_0\delta\dot{u}_0 + \dot{v}_0\delta\dot{v}_0) + I_1(\dot{\phi}\delta\dot{u}_0 + \dot{u}_0\delta\dot{\phi} + \dot{v}_0\delta\dot{\psi} + \dot{\psi}\delta\dot{v}_0) + I_2(\dot{\phi}\delta\dot{\phi} + \dot{\psi}\delta\dot{\psi})]dxdy$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\int_\Omega [I_0(\dot{u}_0\delta\dot{u}_0 + \dot{v}_0\delta\dot{v}_0 + \dot{w}_b\delta\dot{w}_b) + I_1(\dot{\phi}\delta\dot{u}_0 + \dot{u}_0\delta\dot{\phi} + \dot{v}_0\delta\dot{\psi} + \dot{\psi}\delta\dot{v}_0) + I_2(\dot{\phi}\delta\dot{\phi} + \dot{\psi}\delta\dot{\psi})]dx$

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