Unit 6 - Week 4-Concept of strain

Assignment 4

The due date for submitting this assignment has passed. **Due on 2018-02-21, 23:59 IST.**

Submitted assignment

Based on the data given in question 1 , answer question 2

1) ***5 points***

Determine whether the following stress fields are possible in some body currently at rest, but subjected to an elastic deformation from a stress free configuration. Assume that there are no body forces or couples or surface moments acting on the body. Here (x,y,z) denote the coordinates of a typical material particle in the current configuration and c_i some constants.

i. $$\begin{bmatrix} c_1x+c_2y & c_5x-c_1y & 0 \\ c_1y-c_4x & c_3x+c_4y & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

- Yes
- No

No, the answer is incorrect.
Score: 0

Accepted Answers:
No

2) ***5 points***

ii. $$\begin{bmatrix} c_1yz & c_4z^2 & c_5y^2 \\ c_4z^2 & c_2xz & c_6x^2 \\ c_5y^2 & c_6x^2 & c_3xy \end{bmatrix}$$

- Yes
- No

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yes

Based on the data given in question 3 , answer the following questions up to 17

3)

A body in the form of a cube, $B = \{(X, Y, Z) | -1cm \leq X \leq 1cm, -1cm \leq Y \leq 1cm, -1cm \leq Z \leq 1cm\}$ in the reference configuration, is subjected to the following deformation field:

$$x = X,\ y = Y + 0.1\,Z,\ z = 1.1Z,$$

where, (X, Y, Z) are the Cartesian coordinates of a material point before deformation and (x, y, z) are the Cartesian coordinates of the same material point after deformation. Both the reference and current configuration is described using the same coordinate system with basis $\{\mathbf{e}_x, \mathbf{e}_y, \mathbf{e}_z\}$.

The C_{yy} component of the right Cauchy-Green deformation tensor is: _____

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

3 points

4) The C_{yz} component of the right Cauchy-Green deformation tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.1

3 points

5) The C_{zz} component of the right Cauchy-Green deformation tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1.22

3 points

6) The ε_{yz} component of the linearized strain tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.05

3 points

7) The ε_{zz} component of the linearized strain tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.1

3 points

8)
The stretch ratio of a line initially oriented along $\mathbf{e}_z$ direction of length 1 mm located at (0,0.5 cm ,0.5 cm) computed exactly using the right Cauchy-Green deformation tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.1035,1.1055

3 points

9)
The engineering strain of a line initially oriented along $\mathbf{e}_z$ direction of length 1 mm located at (0,0.5 cm ,0.5 cm) computed using the linearized strain tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.1

3 points

10)
The stretch ratio of a line initially oriented along $(\boldsymbol{e}_y + \boldsymbol{e}_z)/\sqrt{2}$ direction of length 1 mm located at (0,0.5 cm ,0.5 cm) computed exactly using the right Cauchy-Green deformation tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1.1

3 points

11)
The engineering strain of a line initially oriented along $(\boldsymbol{e}_y + \boldsymbol{e}_z)/\sqrt{2}$ direction of length 1 mm located at (0,0.5 cm,0.5 cm) computed using the linearized strain tensor is: _____

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.1

3 points

12)
The deformed angle between two line elements initially oriented along $\mathbf{e}_y$ and $\mathbf{e}_z$ directions at (0,0.5 cm ,0.5 cm) computed exactly using right Cauchy-Green deformation tensor is: _____ degrees

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 84.805,84.807

3 points

13)
The change in angle between two line elements initially oriented along $\mathbf{e}_y$ and $\mathbf{e}_z$ directions at (0,0.5 cm ,0.5 cm) computed using linearized strain tensor is: _____ degrees

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 5.72,5.74

3 points

14)
The deformed angle between two line elements initially oriented along $\mathbf{e}_y$ and $(\boldsymbol{e}_y + \boldsymbol{e}_z)/\sqrt{2}$ directions at (0,0.5 cm ,0.5 cm) computed exactly using right Cauchy-Green deformation tensor is: _____ degrees

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 45

3 points

15)
The change in angle between two line elements initially oriented along $\mathbf{e}_y$ and $(\boldsymbol{e}_y + \boldsymbol{e}_z)/\sqrt{2}$ directions at (0,0.5 cm ,0.5 cm) computed using linearized strain tensor is: _____ degrees

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 5.72,5.74

3 points

16 Can the given deformation be classified as small deformation? *3 points*

- Yes
- No

No, the answer is incorrect.
Score: 0

Accepted Answers:
No

17) *3 points*

The deformed shape of the circle defined by: $X = 0$, $Y^2 + Z^2 = 0.01$ would be which of the following?

- Circle
- Ellipse
- Parabola
- Hyperbola

No, the answer is incorrect.
Score: 0

Accepted Answers:
Ellipse

Based on the data given in question 18, answer the following questions up to 32

18)

A body in the form of a cube, $B = \{(X, Y, Z) / -1cm \leq X \leq 1cm, -1cm \leq Y \leq 1cm, -1cm \leq Z \leq 1cm\}$ in the reference configuration, is subjected to the following displacement field:

$$u_x = 0,\ u_y = (Y + Z)10^{-4},\ u_z = -10^{-4}Z,$$

where, (X, Y, Z) are the Cartesian coordinates of a material point before deformation. Both the reference and current configuration is described using the same coordinate system with basis $\{\mathbf{e}_x, \mathbf{e}_y, \mathbf{e}_z\}$. For the specified displacement field compute the following accurately up to first decimal place:

The C_{yy} component of the right Cauchy-Green deformation tensor is: $1+$_____$\times 10^{-4}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 2

3 points

19)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

3 points

20)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) -2

3 points

21 The ε_{yy} component of the linearized strain tensor is: _____$\times 10^{-4}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

3 points

22 The ε_{yz} component of the linearized strain tensor is: _____$\times 10^{-4}$

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.5

3 points

23)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) -1

3 points

24)
The stretch ratio of a line initially oriented along $\mathbf{e}_z$ direction of length 1 mm located at (0,0.5 cm ,0.5 cm) computed exactly using the right Cauchy-Green deformation tensor is: 1+_____$\times 10^{-4}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) -1

3 points

25)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) -1

3 points

26)

The stretch ratio of a line initially oriented along $(e_y + e_z)/\sqrt{2}$ direction of length 1 mm located at (0,0.5 cm ,0.5 cm) computed exactly using the right Cauchy-Green deformation tensor is: 1+_____$\times 10^{-4}$

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.5

3 points

27)

The engineering strain of a line initially oriented along $(e_y + e_z)/\sqrt{2}$ direction of length 1 mm located at (0,0.5 cm,0.5 cm) computed using the linearized strain tensor is: _____$\times 10^{-4}$

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.5

3 points

28)

The deformed angle between two line elements initially oriented along $\mathbf{e}_y$ and $\mathbf{e}_z$ directions at (0,0.5 cm ,0.5 cm) computed exactly using right Cauchy-Green deformation tensor is: 90 +_____$\times 10^{-4}$ degrees

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) -57.4,-57.2

3 points

29)

The change in angle between two line elements initially oriented along $\mathbf{e}_y$ and $\mathbf{e}_z$ directions at (0,0.5 cm ,0.5 cm) computed using linearized strain tensor is: _____$\times 10^{-4}$ degrees

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 57.2,57.4

3 points

30)

The change in angle between two line elements initially oriented along $\mathbf{e}_y$ and $(e_y + e_z)/\sqrt{2}$ directions at (0,0.5 cm ,0.5 cm) computed using linearized strain tensor is: _____ $\times 10^{-4}$ degrees

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 171.7,171.9

3 points

31 **Can the given deformation be classified as small deformation?** ***3 points***

- Yes
- No

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yes

32) ***3 points***

- Circle
- Ellipse
- Parabola
- Hyperbola

No, the answer is incorrect.
Score: 0

Accepted Answers:
Ellipse

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