Unit 11 - Week 9: Hyperelasticity - 2

Assignment 9

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-11-18, 23:59 IST.

For Questions 1 - 6 use the following:
Consider the deformation mapping given by $x_i = \alpha_i X_i$ (no sum over i) where $i = 1, 2, 3$. Here, α_i is a constant. Consider a Neo-Hookean material with strain energy density given by $\Psi = \frac{\mu}{2}(I_C - 3) - \mu \ln J + \frac{\lambda}{2}(\ln J)^2$ where $\mu = 1$ and $\lambda = 2$ are material constants, J is the Jacobian of deformation, and I_C denotes the first invariant of the right Cauchy-Green tensor $\boldsymbol{C}$. Use $\alpha_1 = \alpha_2 = \alpha_3 = 2$.

1) Choose True/False for the following assertion: "The deformation mapping denotes uniform dilatation." ***1 point***

- (a) True
- (b) False

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) True

2) Choose True/False for the following assertion: "The deformation mapping denotes homogenous and isochoric deformation." ***1 point***

- (a) True
- (b) False

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b) False

3) The Jacobian of deformation is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 7.9,8.1

1 point

4) The first invariant of the Cauchy stress tensor is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 2.62,2.72

1 point

5) The third invariant of the Cauchy stress tensor is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.68,0.75

1 point

6) The hydrostatic pressure is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.85,0.95

1 point

For Questions 7 - 10 use the following :
Consider the deformation mapping given by

$$x_1 = \left(1 - \frac{3t}{4}\right) X_1 - \frac{5t}{4} X_2 - \frac{t}{4} X_1 X_2 + \frac{9t}{4}$$
$$x_2 = 2tX_1 + tX_2 + 4t$$
$$x_3 = X_3$$

The material is Neo-Hookean material with strain energy density given by

$$\Psi = \frac{\mu}{2}(I_C - 3) - \mu \ln J + \frac{\lambda}{2}(\ln J)^2$$

where $\mu = 1$ and $\lambda = 2$ are material constants, J is the Jacobian of deformation, and I_C denotes the first invariant of the right Cauchy-Green tensor $\boldsymbol{C}$. Consider a particle initially at $(0, 0, 0)$ and at time $t = 1$.

7) The Jacobian of deformation is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 2.70,2.80

1 point

8) The first invariant of the Cauchy stress tensor is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 3.85,3.95

1 point

9) The third invariant of the Cauchy stress tensor is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.45,1.55

1 point

10) The hydrostatic pressure is _____.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.25,1.35

1 point