

Unit 13 - Week 11: Discretization

Course outline

How does an NPTEL online course work?

Week 0 : Prerequisite

Week 1: Introduction

Week 2: Mathematical Preliminaries - 1

Week 3: Mathematical Preliminaries - 2

Week 4: Kinematics - 1

Week 5: Kinematics - 2

Week 6: Kinetics - 1

Week 7: Kinetics - 2

Week 8: Hyperelasticity - 1

Week 9: Hyperelasticity - 2

Week 10: Linearization

Week 11: Discretization

Lec 32: Discretization of Kinematic Quantities, Equilibrium Equations

Lec 33: Discretization of Linearized Equilibrium Equations

Quiz : Assignment 11

Feedback form

Lecture Notes

Week 12: Solution Procedure

Live session

Assignment 11

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

Due on 2020-12-02, 23:59 IST.

1) Choose True/False for the following assertion: "It is much easier to establish the discretized quantities in spatial configuration." 1 point

- (a) True
 (b) False

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a) True

2) For infinitesimal deformation the final tangent matrix can also be approximated as 1 point

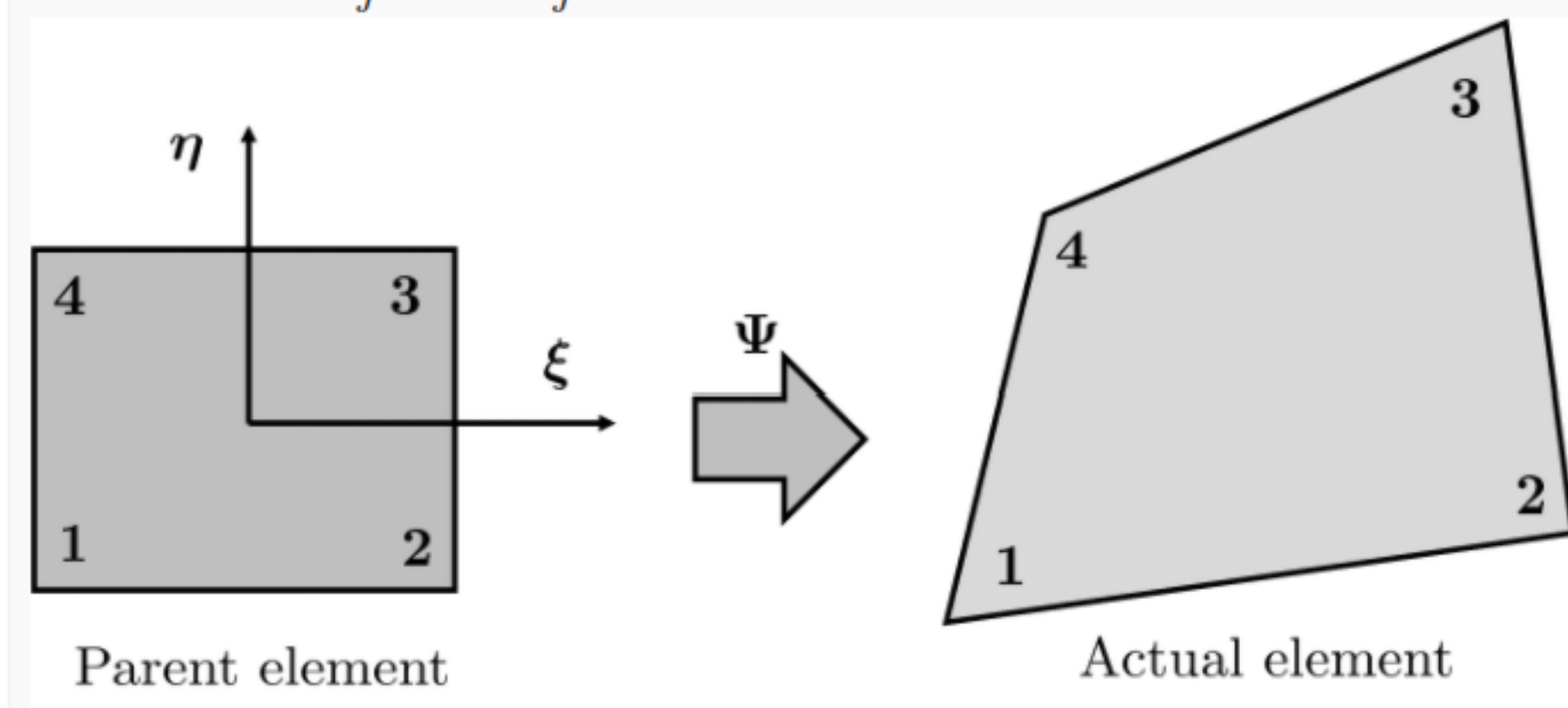
- (a) the initial stress matrix.
 (b) the constitutive component of the tangent matrix.
 (c) either of the initial stress matrix or the constitutive component of the tangent matrix.
 (d) the identity matrix.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b) the constitutive component of the tangent matrix.

For Questions 3 - 8 use the following:

Refer to the below Figure. It shows an element e in the physical (spatial) domain and parent (material) domain. The size of the element in the parent (material) domain is 2×2 . The origin at time $t = 0$ is at the center of the parent element. The spatial coordinates \mathbf{x} of the element are $\mathbf{x}_1 = (4, 2)^T$, $\mathbf{x}_2 = (8, 4)^T$, $\mathbf{x}_3 = (6, 8)^T$ and $\mathbf{x}_4 = (4, 6)^T$. Consider a Neo-Hookean material under plane strain condition with $\mu = 3$ and $\lambda = 2$. The Cauchy stress tensor for this material is given by $\boldsymbol{\sigma} = \frac{\mu}{J}(\mathbf{b} - \mathbf{I}) + \frac{\lambda}{J}(\ln J)\mathbf{I}$. For $\mathbf{X} = (0, 0)^T$ and $\boldsymbol{\xi} = (\xi, \eta)^T$ evaluate the following quantities.



3) The ratio of the volume of the actual element to the parent element is _____.

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 3.43,3.55

1 point

4) The value of the bigger of the in-plane principal stretches (i.e. square root of the eigenvalue of right Cauchy-Green deformation tensor) is _____.

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 2.20,2.30

1 point

5) The value of the smaller of the in-plane principal stretches (i.e. square root of the eigenvalue of right Cauchy-Green deformation tensor) is _____.

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.50,1.60

1 point

6) The value of the out-of-plane component of stress σ_{33} is _____.

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.66,0.74

1 point

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

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 6.80,6.90

1 point

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

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 5.75,5.85

1 point