

## Unit 7 - Week 5: Kinematics - 2

## 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

Lec 14: Worked Examples, Linearized Kinematics

Lec 15: Velocity, Acceleration, Material Time Derivative

Lec 16: Velocity Gradient, Rate of Deformation tensor, Area & Volume Rate, Reynolds Transport Theorem

Lec 17: Solved Examples

Quiz : Assignment 5

Feedback form

Lecture Notes

Solution to Assignment 5

Week 6: Kinetics - 1

Week 7: Kinetics - 2

Week 8: Hyperelasticity - 1

Week 9: Hyperelasticity - 2

Week 10: Linearization

Week 11: Discretization

Week 12: Solution Procedure

Live session

## Assignment 5

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

**Due on 2020-10-21, 23:59 IST.**

1) Choose True/False for the following assertion: "The Lie derivative of the Euler-Almansi strain tensor is the rate of deformation tensor." **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 indicial notation for  $\mathbf{b} = \mathbf{F}\mathbf{F}^T$  is given by  $b_{ij} = F_{iI}F_{jJ}$ ." **1 point**

- (a) True  
 (b) False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(b) False

3) Choose True/False for the following assertion: "The linearization of a tensor quantity, over the motion  $\psi$ , in the direction of velocity vector is same as the material time derivative of the tensor." **1 point**

- (a) True  
 (b) False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(a) True

4) Choose True/False for the following assertion: "Linearization of the Green-Lagrange strain tensor about the initial configuration results in the small strain tensor." **1 point**

- (a) True  
 (b) False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(a) True

5) Choose True/False for the following assertion: "The indicial notation for  $\mathbf{e} = \mathbf{F}^{-T}\mathbf{E}\mathbf{F}^{-1}$  is given by  $e_{ij} = F_{iI}^{-1}E_{IJ}F_{jJ}^{-1}$ ." **1 point**

- (a) True  
 (b) False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(b) False

For Questions 6 - 8 use the following:

A motion  $\mathbf{x} = \psi(\mathbf{X}, t)$  is described by the mapping

$$x_1 = X_1 + atX_2$$

$$x_2 = bt^2X_1 + X_2$$

$$x_3 = X_3$$

where  $a = 1$  and  $b = 1/2$  are constants.

6) The speed of a particle at time  $t = 1$  initially located at  $(0, 1, 0)^T$  is \_\_\_\_\_.

Hint

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(Type: Numeric) 1  
(Type: Numeric) 1.0

**1 point**

7) The magnitude of the acceleration of a particle at time  $t = 1$  initially located at  $(1, 0, 0)^T$  is \_\_\_\_\_.

Hint

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(Type: Numeric) 1  
(Type: Numeric) 1.0

**1 point**

8) The path, in the space, of a particle that was initially located at  $(1, 2, 4)^T$  is \_\_\_\_\_

Hint

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(Type: String) parabola  
(Type: String) parabolic

**1 point**

9) For pure rotation, the determinant of the rate of deformation tensor is \_\_\_\_\_.

Hint

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(Type: Numeric) 0

**1 point**

10) The velocity field of a rigid body rotating about the  $x_3$ -axis is given by  $\mathbf{v} = -\omega_1x_2\mathbf{e}_1 + \omega_2x_1\mathbf{e}_2 + \omega_3\mathbf{e}_3$ , where  $\boldsymbol{\omega} = (\omega_1, \omega_2, \omega_3)^T$  denotes a constant angular velocity vector. Then, for  $\boldsymbol{\omega} = (2, 2, 0)^T$ , the magnitude of the acceleration field for a particle currently at  $(1, 0, 0)^T$  is \_\_\_\_\_.

Hint

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(Type: Numeric) 4  
(Type: Numeric) 4.0

**1 point**