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NPTEL

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Courses » Compliant Mechanisms : Principles and Design

Announcements Course Ask a Question Progress

Unit 4 - Week 2: Modeling of flexures and finite element analysis



Course outline

How to access the home page?

Assignment 0

Week 1:
Overview of compliant mechanisms; mobility analysis.

Week 2:
Modeling of flexures and finite element analysis

- Lec 7: Empirical formula for flexure joints
- Lec 8: Types of elastic pairs (flexures)
- Lec 9: Linear finite element analysis of compliant mechanisms with beam elements
- Lec 10: A compliant mechanism kit
- Lec 11: Linear and nonlinear finite element analyses using continuum elements
- Lec 12: Subtleties in finite element analysis - geometric nonlinearity and contact

Assignment Week 2

The due date for submitting this assignment has passed. **Due on 2018-02-07, 23:59 IST.** As per our records you have not submitted this assignment.

1) Precision flexure mechanism has

1 point

- Discrete compliance.
- Distributed compliance.
- Both.
- None.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Discrete compliance.

2) The right order to be followed while formulating a beam finite element model of a compliant mechanism is

1 point

1. Determining beam cross-sections
2. Implement the FEA code
3. Identifying the nodes
4. Identifying the elastic segments

- 1-2-3-4
- 4-3-1-2
- 3-4-1-2
- 4-1-3-2

No, the answer is incorrect.

Score: 0

Accepted Answers:

3-4-1-2

3) Nonlinearity in elastic bodies cannot arise solely due to

1 point

- Contact
- Large rotations
- Initial geometry of the elastic member
- Large strains

No, the answer is incorrect.

Score: 0

Accepted Answers:

Initial geometry of the elastic member

4) A good compliant revolute joint is expected to have the following primary characteristic?

1 point

- Quiz :
Assignment
Week 2
- Solutions

Week 3: Large-displacement analysis of a cantilever beam and pseudo rigid-body modeling

Week 4: Analysis and synthesis using pseudo rigid-body models

Week 5: Structural optimization approach to "design for deflection" of compliant mechanisms

Week 6: Designing compliant mechanisms using continuum topology optimization; distributed compliance

Week 7: Spring-lever (SL) and spring-mass-lever (SML) models for compliant mechanisms, and selection maps

Week 8: Non-dimensional analysis of compliant mechanisms and kineoelastic maps

Week 9: Instant centre and building-block methods for designing compliant mechanisms

Week 10: Bistable compliant mechanisms and static balancing of compliant mechanisms

- Low axis-drift
- Large range of motion
- Low stress concentrations
- High ratio of on-axis to off-axis stiffness

No, the answer is incorrect.

Score: 0

Accepted Answers:

High ratio of on-axis to off-axis stiffness

5) Multi-axis compliance matrix of a compliant mechanism is a

- Triangular matrix
- Diagonal matrix
- Symmetric matrix
- Skew symmetric matrix

No, the answer is incorrect.

Score: 0

Accepted Answers:

Symmetric matrix

6) If you were to assemble the compliant crimper shown in the figure with the compliant mechanism kit, the minimum number of semi-rigid connectors you would need is



- 8
- 9
- 10
- 11

No, the answer is incorrect.

Score: 0

Accepted Answers:

10

7) During nonlinear deformation of a cantilever beam with an end load, stress stiffening can occur due to

1. Axial deformation.
2. Large transverse deformation.

- Only 1.
- Only 2.
- Both 1 and 2
- Neither 1 nor 2.

No, the answer is incorrect.

Score: 0



1 point

1 point

1 point

Week 11: Compliant mechanisms and microsystems; materials and prototyping of compliant mechanisms

Week 12: Six case-studies of compliant mechanisms

MATLAB Online Access

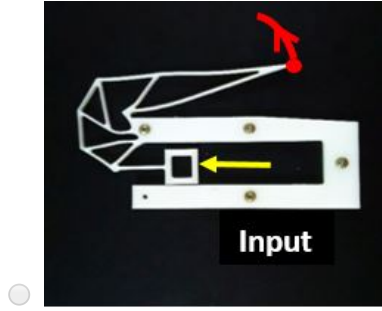
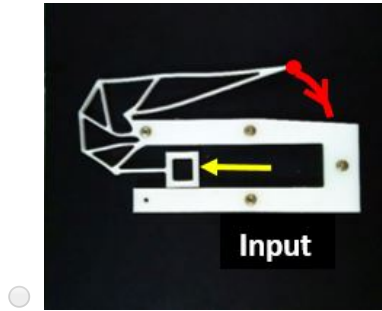
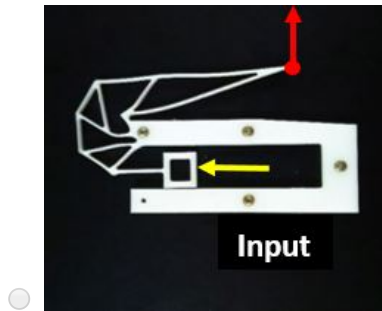
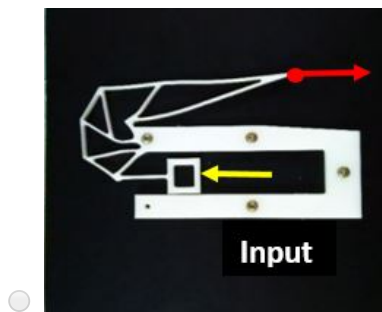
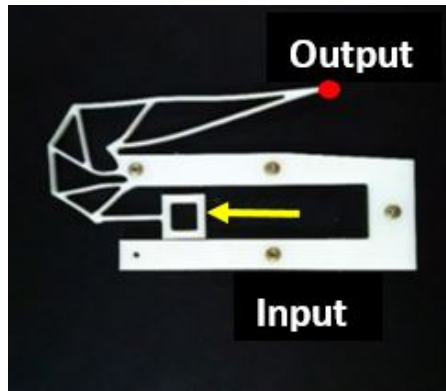
MATLAB: Introduction to MATLAB

MATLAB: Vector and Matrix Operations

MATLAB: Advanced Topics

Accepted Answers:
Both 1 and 2

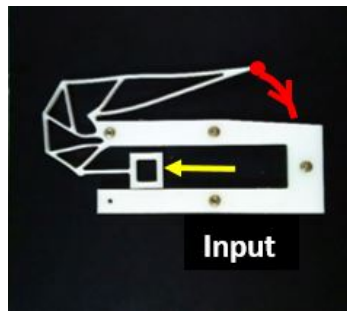
8) Identify the direction of the output for the given compliant mechanism, if the input is as shown **1 point** in the figure



No, the answer is incorrect.
Score: 0

Accepted Answers:





9) Which of the following is NOT a 1-DoF elastic rotational pair?

- Split-tube flexure
- Cruciform flexure
- Spherical notch joint
- Bendix joint

No, the answer is incorrect.

Score: 0

Accepted Answers:

Spherical notch joint

10) A circular flexure hinge undergoes a rotation of 45 degrees. Which of the following is most reliable to compute its compliance?

- Mitosis method
- Nonlinear finite element analysis.
- Paros and Weisbord's empirical relations.
- Smith et al.'s empirical rotational compliance equation.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Nonlinear finite element analysis.

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