Assignment Week 4

The due date for submitting this assignment has passed. Due on 2018-02-21, 23:59 IST.
As per our records you have not submitted this assignment.

1) Which of the following is not possible using pseudo rigid-body model approach?  
   - Function generation  
   - Path generation.  
   - Feasibility map generation.  
   - Motion generation.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Feasibility map generation.

2) Assertion: Torsion spring(s) and a rigid body can replace a compliant segment. Reasoning:  
The locus of the moving tip of a cantilever beam can be approximated to a circular arc.

- Assertion is correct but not the reasoning.  
- Assertion is incorrect but the reasoning is correct.  
- Assertion and reasoning are both correct.  
- Neither the assertion nor the reasoning is correct.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Assertion and reasoning are both correct.

3) Which of the following are not used for solving compliant mechanism synthesis problem using the PRBM approach?

- Replacement of compliant segments with torsion spring(s) and a rigid bodies.  
- Optimization  
- Minimum potential energy principle.  
- Burmester theory.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Optimization

4) Find the torsional spring constant in the PRBM of beam with small length flexure shown in the figure (E = 2.1 GPa, length of flexure = 5 mm, in-plane thickness of flexure = 0.5 mm, width = 1 cm).
5) Which of the following is the correct loop-closure equation for the PRBM model of a compliant mechanism?

\[ l_1 \cos(\theta) - l_2 \cos(\phi) - l_3 \cos(\psi) = 0 \]
\[ l_1 \cos(\theta) + l_2 \cos(\phi + \gamma) - l_3 \cos(\psi) = 0 \]
\[ l_1 \sin(\theta) + l_2 \sin(\phi) + l_3 \sin(\psi) = 0 \]
\[ l_1 \sin(\theta) - l_2 \sin(\phi + \gamma) + l_3 \sin(\psi) = 0 \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.0438 Nm/rad
0.0512 Nm/rad
0.8028 Nm/rad
0.0842 Nm/rad

6) In a function generation probe of the compliant mechanism shown in the figure, how many free variables need to be chosen in order to solve the synthesis equations?
7) In Q. 6, if the dimensions of the coupler-body are given, how many extra positions are need to be specified so that there are no free variables?

- 4
- 3
- 2
- 1

No, the answer is incorrect.
Score: 0
Accepted Answers: 5

8) A load of constant magnitude is applied to a cantilevered beam tip and it continues to remain in the transverse direction as the beam deforms. Calculate the angle of deflection of cantilever beam when the value of \( n \) (ratio of axial to vertical component of force) becomes 0.577.

- 45 deg
- 60 deg
- 30 deg
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers: 30 deg

9) For the compliant mechanism (undeformed state) shown in the figure, calculate the kinematic sensitivity \( \frac{d\theta}{d\tau} \) when an external torque \( \tau = 0.006 \text{ Nm} \) has caused \( \theta \) to deflect by an angle. [Given \( l = a \)
In the diagram, we have:

- \( l \) = 5 cm
- \( \gamma \) (characteristic radius factor) = 0.85
- \( \Delta \theta \) and \( \tau \) are in clockwise direction

We need to calculate the value of \( \Delta \theta \) given in Q. 9. Take \( EI = 2.5e^{-4} \) and \( \gamma \kappa = 2.25 \).

Here are the options for \( \Delta \theta \):

- 0.000 rad
- 0.131 rad
- 0.262 rad
- 0.523 rad

No, the answer is incorrect.
Score: 0
Accepted Answers: 1

Calculate the value of \( \Delta \theta \) given in Q. 9. Take \( EI = 2.5e^{-4} \) and \( \gamma \kappa = 2.25 \).

No, the answer is incorrect.
Score: 0
Accepted Answers: 0.523 rad