Unit 10 - Week 8: Non-dimensional analysis of compliant mechanisms and kinetoelastic maps

Assignment Week 8

The due date for submitting this assignment has passed. **Due on 2018-03-21, 23:59 IST.**
As per our records you have not submitted this assignment.

1) Match the following *1 point*

Elliptic Integrals	Expressions
i I kind (incomplete)	a) $\int_0^{\pi/2} \sqrt{1-p^2\sin^2\phi}\ d\phi = \mathbf{E}(p,\pi/2)$
ii I kind (complete)	b) $\int_0^{\phi^*} \sqrt{1-p^2\sin^2\phi}\ d\phi = \mathbf{E}(p,\phi^*)$
iii II kind (incomplete)	c) $\int_0^{\phi^*} \frac{d\phi}{\sqrt{1-p^2\sin^2\phi}} = \mathbf{F}(p,\phi^*)$
iv II kind (complete)	d) $\int_0^{\pi/2} \frac{d\phi}{\sqrt{1-p^2\sin^2\phi}} = \mathbf{F}(p,\pi/2)$

- i-c, ii-d, iii-b, iv-a
- i-b,ii-c,iii-a, iv- d
- i-c, ii-a,iii-b, iv- d
- i-a, ii-b,iii-c, iv- d

No, the answer is incorrect.
Score: 0

Accepted Answers:
i-c, ii-d, iii-b, iv-a

2) Set up a dimensionless parameter by combining the parameters such as ρ(Density), A (Area), D (Diameter), Δp (Pressure difference) using the principles of Buckingham pi theorem. *1 point*

- $\frac{\Delta p}{\rho A^3}$
- $\frac{\Delta p}{\rho A^2}$
- $\frac{\Delta p}{\rho DA}$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
None of the above

3) Which of the following are sufficient to express most elastic responses of beam-based compliant mechanisms in non-dimensionalized form? ***1 point***

- $\frac{FL^2}{Ebd^3}$
- $\frac{L}{d}$
- $\frac{FL^2}{Ebd^3}, \frac{L}{d}$
- $\frac{L}{b}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{FL^2}{Ebd^3}, \frac{L}{d}$

4) Assertion: The KES maps obtained for the bending of cantilever beam through analytical equations exactly matches with nonlinear finite elemental analysis. ***1 point***

Reasoning: The analytical equations accounts for all deformations including axial stretching.

- Assertion and reasoning are correct and the assertion follows from the reasoning.
- Assertion and reasoning are correct but the assertion does not follow from the reasoning.
- Assertion is correct but the statement in the reasoning is incorrect.
- Assertion is wrong and so is the reasoning.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Assertion is wrong and so is the reasoning.

5) Mark the following statements as true or false. ***1 point***

The cross-section profile of a mechanism does not affect the kinetoelastic maps as long as the inertia is not altered.

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

6) Find the width b for the suspension shown in figure 6a using the KES maps given in figure 6b ***1 point***

Data: K= 1 N/m
Force = 1e-6 N
Young's modulus= 84.5 GPa
s=100
l=1 mm

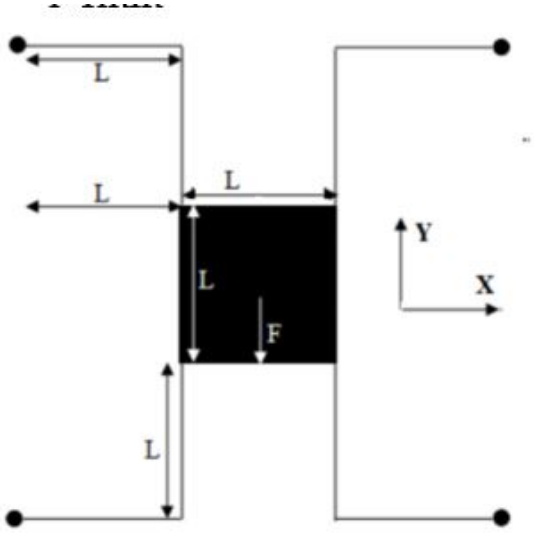


Figure 6a

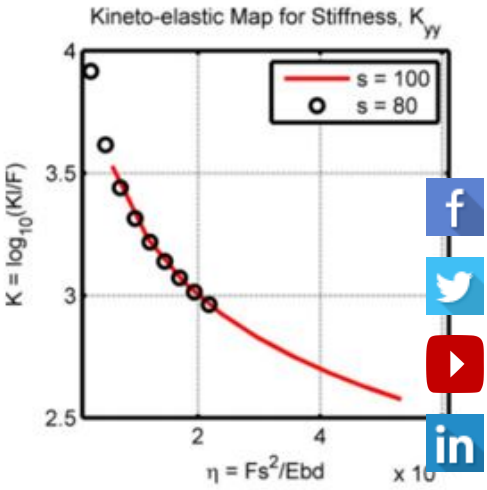


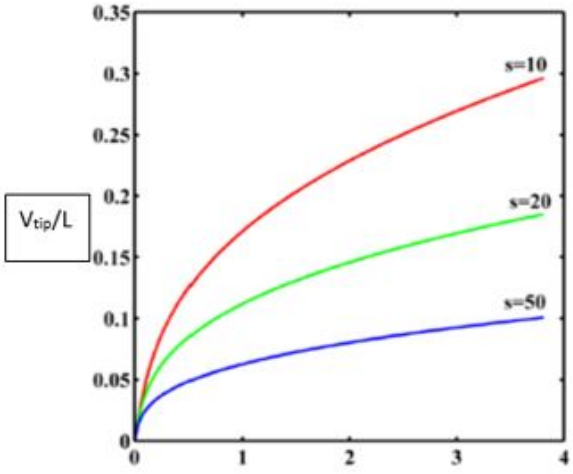
Figure 6b

- 2570nm
- 5917 nm
- 8750 nm
- 9750 nm

No, the answer is incorrect.
Score: 0

Accepted Answers:
5917 nm

7) If L = 0.5 m, b = 5 cm, d = 2.5 cm, E = 100 GPa, and F = 0.625 MN, what is the transverse displacement of the tip (closest value)? ***1 point***



$$\eta = \frac{Fs^2}{Ebd}$$

- 8 cm
- 15 cm
- 8 mm
- 75 mm

No, the answer is incorrect.
Score: 0

Accepted Answers:
75 mm

8) Which statement is true among the following *1 point*

- KES maps are not affected by the scale of the mechanism
- Inherent nonlinearity is accounted in KES maps
- Both A and B
- Neither A nor B

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both A and B

9) Which of the following equations supports the assumption of no axial deformation in non-dimensional analysis *1 po*

$$\int_0^L ds = L = \int_0^{\theta_L} \frac{d\theta}{\sqrt{\frac{2F}{EI}(\sin\theta_L - \sin\theta)}}$$

$$\int_0^{\theta_L} \frac{d\theta}{\sqrt{(\sin\theta_L - \sin\theta)}} = \sqrt{2\eta}$$

- Both A and B
- Neither A nor B

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\int_0^L ds = L = \int_0^{\theta_L} \frac{d\theta}{\sqrt{\frac{2F}{EI}(\sin\theta_L - \sin\theta)}}$$

10) Mark the following statements as true or false. *1 point*
The more the axial deformation in a mechanism, the narrower the KES maps

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

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