

Unit 7 - Week 5

Course outline

How does an NPTEL online course work?

Week 0

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Week 5

Quiz : Assignment 5

Week 6

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Assignment 5

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

Due on 2020-03-25, 23:59 IST.

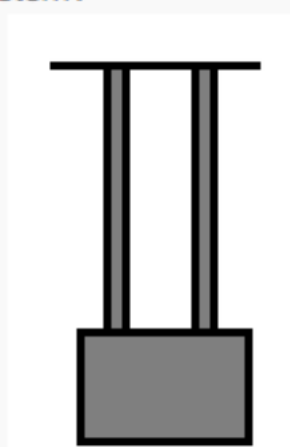
- 1) What is the critical length (in mm) for a glass cube having density $2500 \text{ Kg}/\text{m}^3$ to float on a fluid having surface tension $27.56 \text{ mN}/\text{m}$? Neglect the buoyancy force acting on block (Take $g = 9.8 \text{ m}/\text{s}^2$).

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.9,2.3

2 points

- 2) A block is hanging vertically downwards by 2 parallel beams of width W, length L and depth H. The beam material has elasticity E. What will be the equivalent spring constant of such a system?



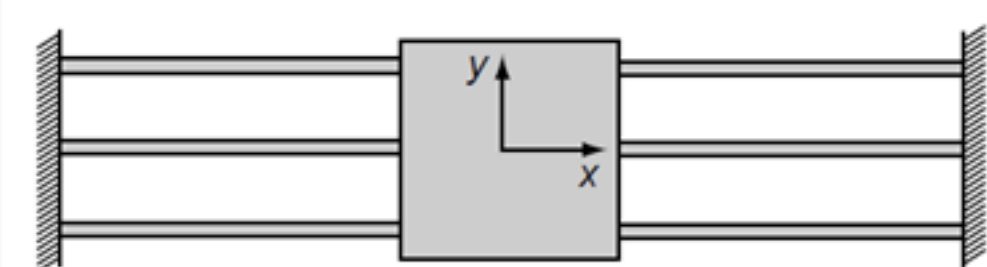
- $\frac{WHE}{L}$
- $\frac{WHE}{2L}$
- $\frac{2WHE}{L}$
- $\frac{WHE}{4L}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\frac{2WHE}{L}$

2 points

- 3) Suspension of an accelerometer is as shown below. There are three beams on either side of the square proof mass $50 \mu\text{g}$ mass. The beams are identical. They are $150 \mu\text{m}$ long and have an in-plane width of $8 \mu\text{m}$ and an out-of-plane thickness $2 \mu\text{m}$. They are made of polysilicon with $Y = 169 \text{ GPa}$. How much does the proof mass move in the y-direction for 1 g ($9.8 \text{ m}/\text{s}^2$) acceleration in that direction (in nm)?



No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.5,1.7

3 points

- 4) The capacitance of two concentric metal shells, with radii a and b (where, $a < b$) is

- $C = 4\pi\epsilon_0 \frac{ab}{(b-a)}$
- $C = 4\pi\epsilon_0 \frac{ab}{(b+a)}$
- $C = 4\pi\epsilon_0 \frac{a^2 b^2}{(b^2 - a^2)}$
- $C = 4\pi\epsilon_0 \frac{a^2 b^2}{(b^2 + a^2)}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $C = 4\pi\epsilon_0 \frac{ab}{(b-a)}$

2 points

- 5) If the plates of a parallel plate capacitor move closer together by a distance ' Δ ', what will be the magnitude work done in terms of the field 'E' and area of the plates 'A'

- $\frac{(\epsilon_0 E^2 A^2 \Delta^2)}{2}$
- $\frac{(\epsilon_0 E^2 A \Delta)}{2}$
- $\frac{(\epsilon_0 E^2 \Delta^4)}{2A}$
- $\frac{(\epsilon_0 E^2 A)}{2\Delta}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\frac{(\epsilon_0 E^2 A \Delta)}{2}$

1 point

- 6) Which of the following is isotropic etchant?

- 30% KOH solution
- HNA etchant
- EDP at 115°C
- TMAH at 70°C to 90°C

No, the answer is incorrect.
Score: 0

Accepted Answers:
HNA etchant

1 point

- 7) Which of the following methods cannot control the etching rate of silicon substrate?

- Concentration of KOH solution
- Temperature at which etching takes place
- Thickness of the masking layer
- Boron doping concentration of Si substrate

No, the answer is incorrect.
Score: 0

Accepted Answers:
Thickness of the masking layer

1 point

- 8) Choose the correct statement :

- i. Boron doping concentration at certain regions can be increased so that, those regions will act as mask and will not be etched away and structures like diaphragm and cantilevers could be obtained.
- ii. There is no etching in 111 direction of a single crystal Si wafer using KOH solution.
- Only i is correct
- Only ii is correct
- Both i and ii are correct
- Both i and ii are wrong

No, the answer is incorrect.
Score: 0

Accepted Answers:
Only i is correct

1 point

- 9) A $\langle 100 \rangle$ silicon wafer is $500 \mu\text{m}$ thick. A mask consists of rectangular window of unknown size. The sides of the window are parallel to $\langle 110 \rangle$. After wafer etching a hole size of $50 \mu\text{m} \times 80 \mu\text{m}$ is formed on the other side of the wafer ($50 \mu\text{m}$ along X axis, and $80 \mu\text{m}$ along Y axis). What will be the size of the mask window, along X axis? The undercut rate is negligible. (inward slope = 54.74°)

_____ μm

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 740,770

2 points

- 10) What will be the burst pressure (in bar) for the membrane with dimensions (young's modulus 170 GPa) – side $2a = 500 \mu\text{m}$ and thickness $h = 10 \mu\text{m}$, if maximum strength of silicon is 7 GPa ?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 100,125

3 points

- 11) Which of the following is most preferred as the sensing element in a piezoresistive sensors?

- Metal foils
- Thin metal films
- Diffused semiconductor
- Polycrystalline silicon

No, the answer is incorrect.
Score: 0

Accepted Answers:
Diffused semiconductor

1 point

- 12) For a square membrane of side $2a$ and thickness h , choose the correct relation, where σ is the stress due to pressure

- $\sigma_{max} = P_{max} \left(\frac{a}{h}\right)^3$
- $\sigma_{max} = P_{max} \left(\frac{a}{h}\right)^2$
- $\sigma_{max} = P_{max} \left(\frac{h}{a}\right)^2$
- $P_{max} = \sigma_{max} \left(\frac{a}{h}\right)^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\sigma_{max} = P_{max} \left(\frac{a}{h}\right)^2$

1 point