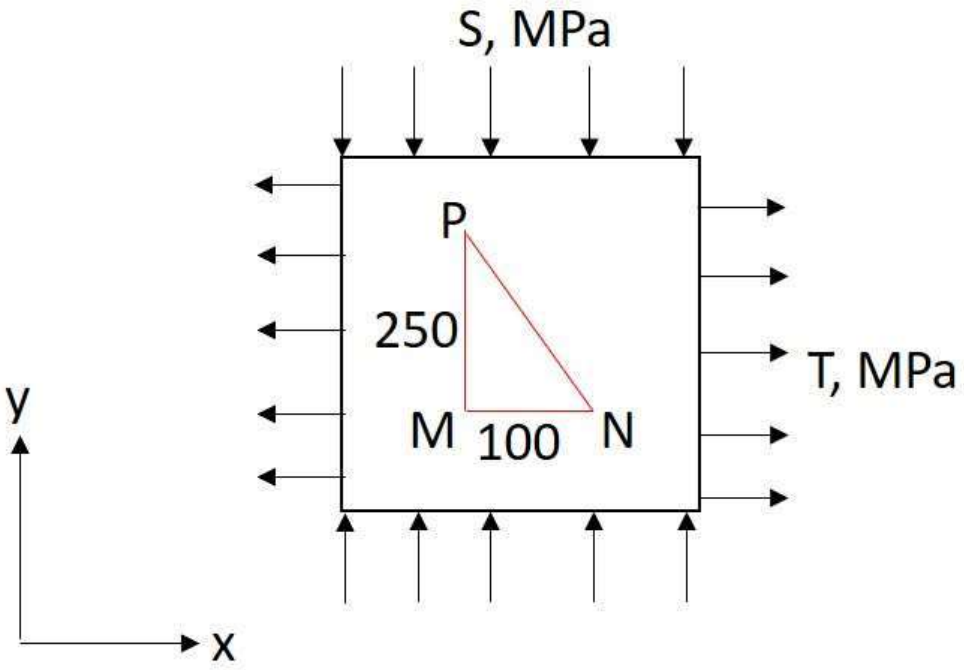
Started on	Thursday, 17 March 2022, 2:00 PM
State	Finished
Completed on	Thursday, 17 March 2022, 3:09 PM
Time taken	1 hour 9 mins
Grade	[redacted]

Question 1

A cube of side 1200 mm is subjected to stresses as shown in the figure, S = 13.5 MPa and T = 10.5 MPa. The Young's modulus is E= 200 GPa and the Poisson's ratio is 0.3



Find the deformation (in mm) in line MN

One possible correct answer is: 0.007275

Find the deformation (in mm) in line PM

One possible correct answer is: -0.0208125

Find the area of the triangle PMN after the load has been applied

One possible correct answer is: 12500.131174295

The change in volume for above material and loading is dv (given). If the same load is applied to another cube with same dimensions but having modulus = 3E, the corresponding change in volume is dv' (given). What is the ratio of dv'/dv ?

One possible correct answer is: 0.3333

Question **2**

A disc of 20 kg is balanced by two cables as shown in the figure. Take g = 9.81 m/s2. A load P = 180 N is applied at a distance x from cable b as shown in the figure.

The diameter of the disc is 50 mm.

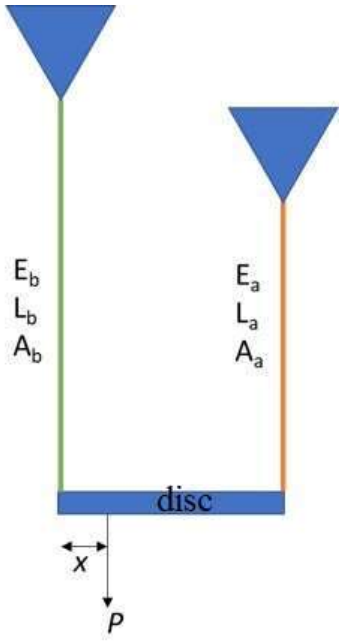
The following data is given:

Young's modulus: Eb = 220 GPa; Ea = 160 GPa

Cross-sectional area: Ab = 20 mm2; Aa = 24 mm2

Length of the cables: Lb = 113 mm, La = 85 mm

The disc is rigid and does-not deform. Also note the figure is not drawn to scale



At what distance "x" in mm, must the load P be applied such that the stress in both the cables are same

One possible correct answer is: 29.75

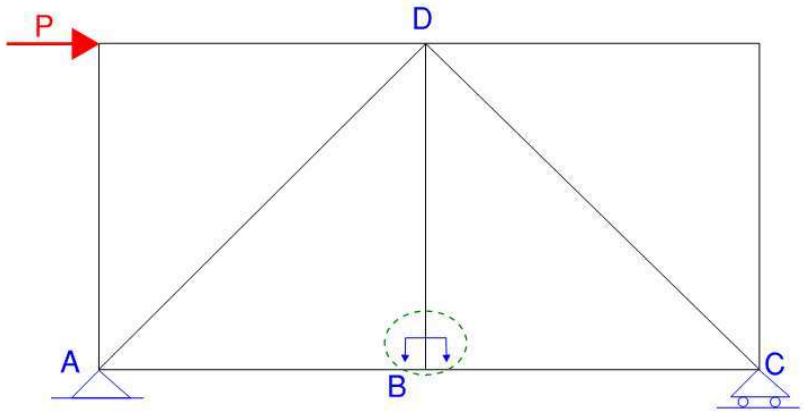
When the stresses in the two cables are same, what is the ratio of the deformation (deformation in cable A/deformation in cable B)?

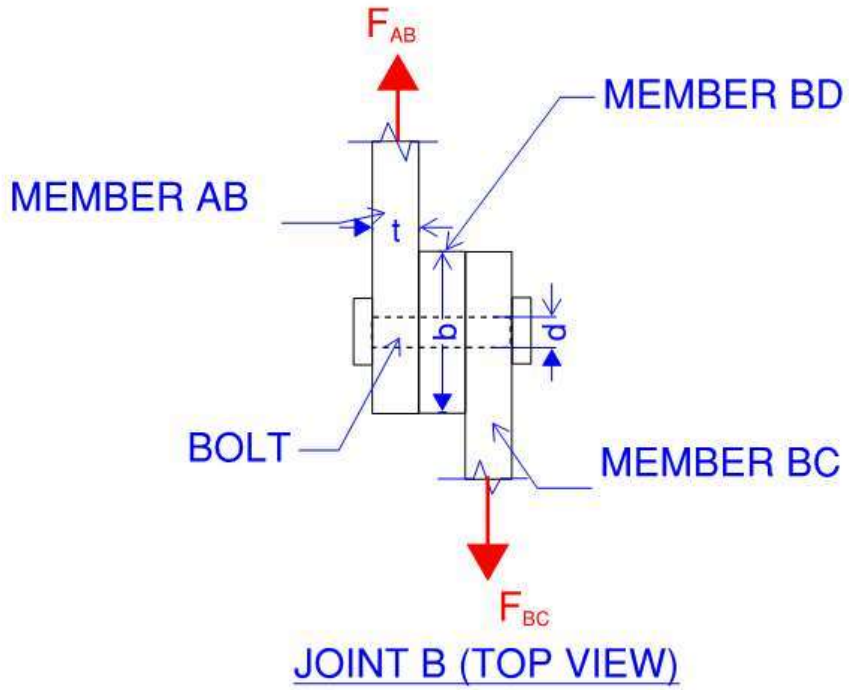
One possible correct answer is: 1.0342920353982

Question **3**

[redacted]

In the truss shown below, the load P results in a tensile force F_{AB} = 3 kN in member AB. Each member of the truss has a rectangular cross section of width b=86 mm and thickness t=37mm. The connection detail at bolted joint B is as shown. The bolt diameter is d=16 mm. In the following questions, provide magnitudes of all values only (do not include +ve or -ve sign).





What is the maximum average normal stress in member AB (in MPa)?

[redacted]

One possible correct answer is: 1.1583011583012

What is the maximum bearing stress in member AB (in MPa)?

[redacted]

One possible correct answer is: 5.0675675675676

What is the maximum shear stress in the bolt (in MPa)?

One possible correct answer is: 14.920775914865

What is the maximum bearing stress in member BC (in MPa)?

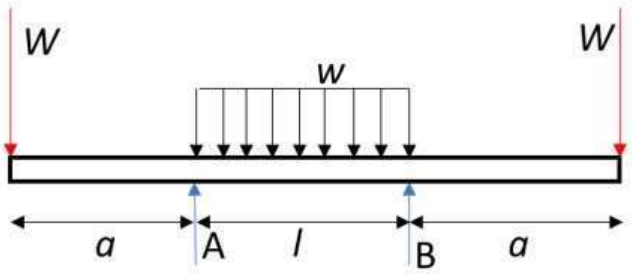
One possible correct answer is: 5.0675675675676

What is the maximum average normal stress in member BD (in MPa)?

One possible correct answer is: 0

Question **4**

A simply supported beam (supported at A and B) with equal overhangs is loaded as shown in the figure. At the two tips, point load, W kN is applied, while the centre region has uniformly distributed load of w KN/m, if W = 3 *wl.



Fill in the blanks: the magnitude of reactions at A = _____*wl

One possible correct answer is: 3.5

What is the ratio of a/l such that the bending moment at the centre of the beam is zero?

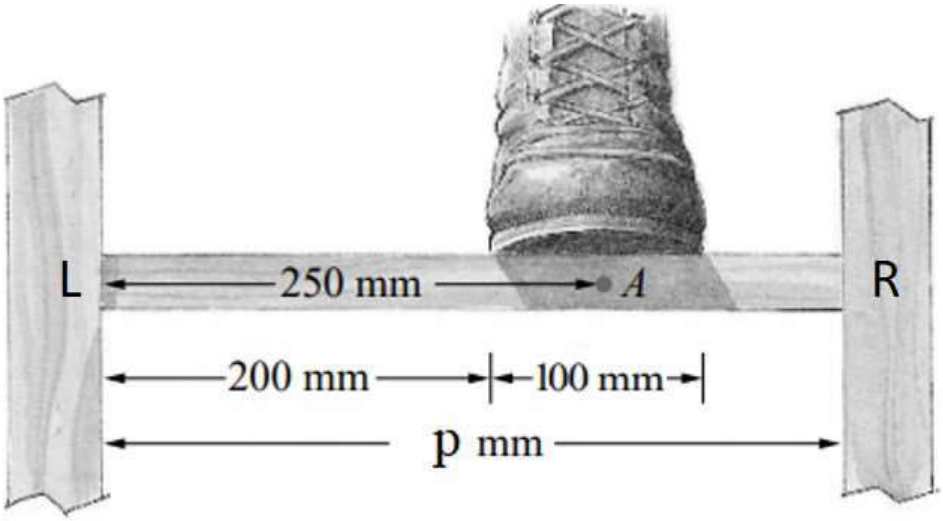
One possible correct answer is: 0.041666666666667

Fill in the blanks: For the a/l value calculated in 2nd part of this question, the shear force at the centre of the beam is ____ times wl.

One possible correct answer is: 0

Question **5**

While climbing a ladder, a person is exerting a vertically downward distributed force of 850 N by his shoe uniformly distributed over a length of 100 mm of the ladder rung as shown. Assuming the ladder rung to behave like a simply supported (pin supported) beam having length p=425 mm, write the magnitudes (without any sign) of the following quantities-



Calculate the magnitude of reactions, in N at end L

One possible correct answer is: 350

Calculate the magnitude of reactions, in N at end R

One possible correct answer is: 500

Calculate the magnitude of bending moment (in N.mm) at point A

One possible correct answer is: 76875

Calculate the magnitude of shear force (in N) at point A

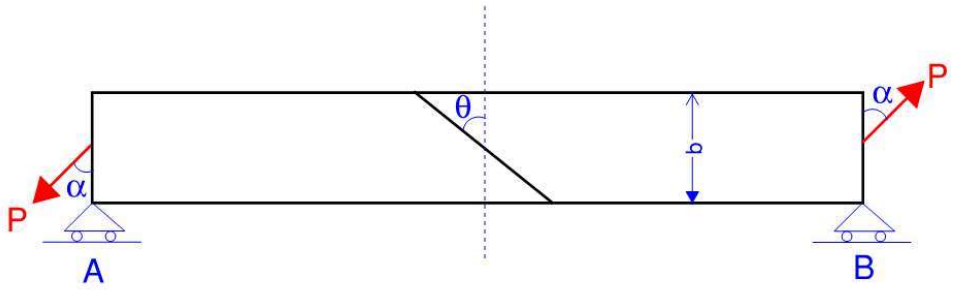
One possible correct answer is: 75

Question **6**

Incorrect

Mark 0.00 out of 5.00

Two pieces of wood are glued together along an oblique splice that makes an angle θ = 37° with the vertical. Each piece has a rectangular cross section, with depth b = 82 mm and thickness 39 mm. This assembly is supported at ends A and B on roller supports. Equal and opposite loads of magnitude P = 32 kN, making an angle α = 22° with the vertical, are applied at the two ends.



The area of the oblique splice in mm^2 is :

One possible correct answer is: 4004.3298347836

What is the magnitude of the resultant reaction at A in kN?

One possible correct answer is: 29.669883346137

What is the normal stress in MPa on the oblique splice area? Provide +ve answer if the stress is tensile, -ve answer if the stress is compressive

One possible correct answer is: 2.3908050746551

What is the magnitude of shear stress in MPa on the oblique splice area? Provide value only, do not include sign.

One possible correct answer is: 1.8016008470127

Question **7**

Partially correct

Mark 3.60 out of 6.00

The cylindrical vessel, has outer diameter 198 mm and thickness 5 mm. The cylinder is subjected to an internal pressure (gauge) of 7 MPa. The Young's modulus and the Poisson's ratio of the material are 200 GPa and 0.3, respectively.

Calculate the Hoop (circumferential) stresses, in MPa in the cylinder.

[redacted]

One possible correct answer is: 131.6

Calculate the longitudinal stresses, in MPa in the cylinder.

[redacted]

One possible correct answer is: 65.8

Calculate the new diameter, in mm of the cylinder.

[redacted]

One possible correct answer is: 198.1107414

◄ Test 1 Part B

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