

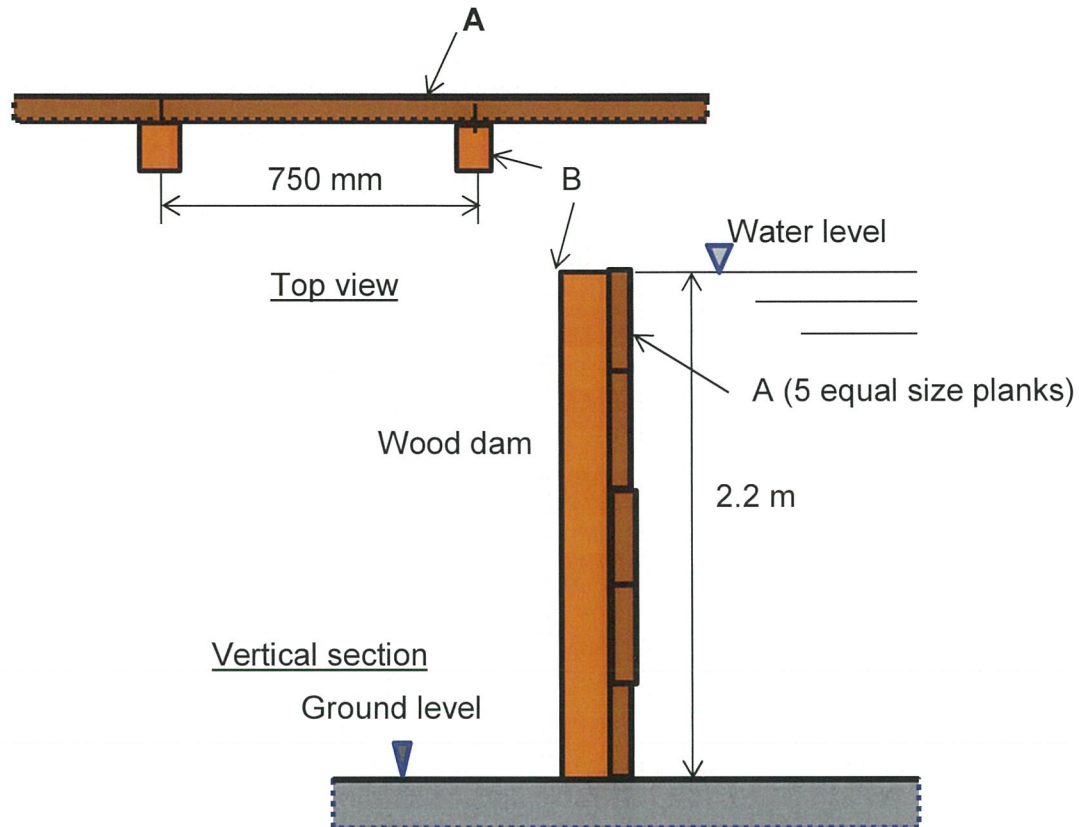
Mechanics of Solids 232 Assignment 2014

°Show workings

°Credit will be awarded for neatness

Submit completed Individual assignment cover sheet together with your assignment

Question 1

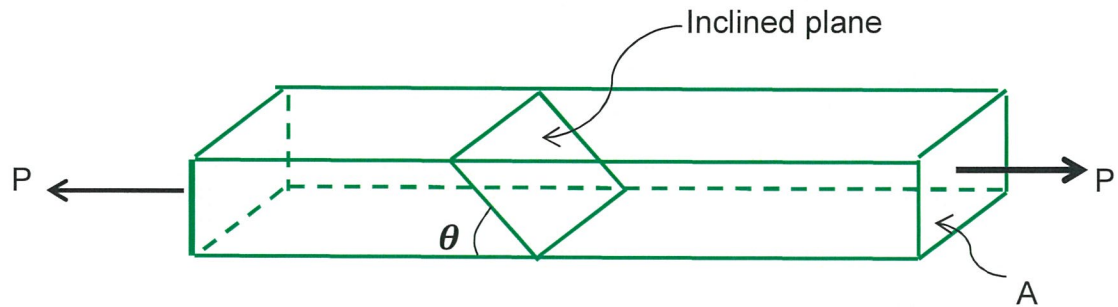


A temporary wood dam is constructed of horizontal wood planks A supported by vertical wood posts B that are sunk into the ground so that they act as a cantilever. The posts are of square cross-section, b mm by b mm, and spaced at 750 mm centre to centre. Assume that the water level behind the dam is at its full height of 2.2 m.

The allowable bending stress in the wood (post and plank) is 8 MPa.

- (i) Determine the minimum required numerical value of the dimension b of the posts in terms of mm.
(4 marks)
- (ii) Assume that the planks are simply supported between posts, and also to be on the safer side assume that the pressure on the bottom plank is uniform and equal to maximum pressure. Determine the minimum required thickness of the planks in terms of mm.
(5 marks)

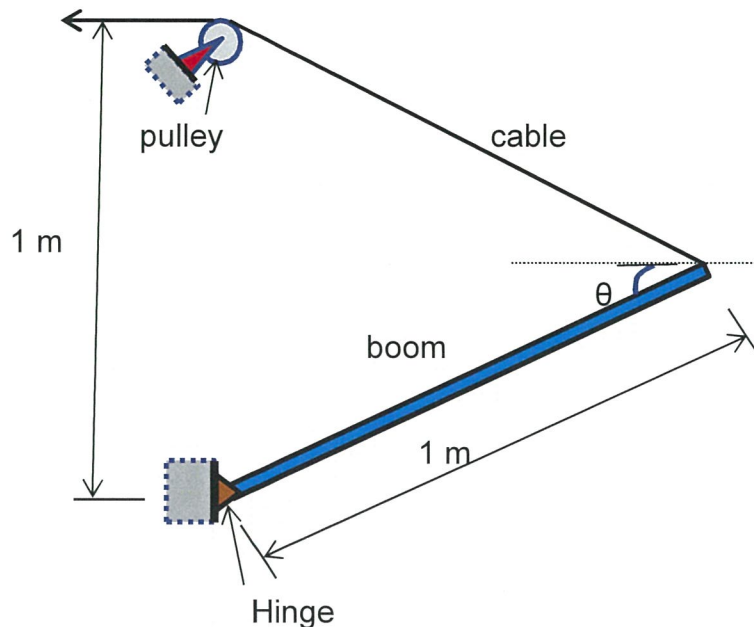
Question 2



The bar has a cross-sectional area A and is subjected to an axial load P .

- i) Derive equations for the normal stress σ and shear stress τ acting over the inclined plane, which is oriented at θ from horizontal,
(4 marks)
 - ii) Taking $P=800\text{N}$ and the cross-sectional area of the bar as 40 mm by 40mm , simplify the above equations.
(2 marks)
 - iii) Tabulate the values σ (MPa) and τ (MPa) as a function of θ (radians) for $0 \leq \theta \leq \pi/2$ at 0.1π interval, and
(5 marks)
 - iv) Using the tabulated values in (iii). Plot the variation of stresses σ (MPa) and τ (MPa) versus θ (radians). Name axes of the graph and provide graph title.
(5 marks)
- Use Excel or similar for (iii) and (iv)

Question 3



The boom has a uniform weight of W kN and is hoisted into position using cable. If the cable has a diameter of d mm,

- i) Derive an equation for the normal stress, σ in the cable in terms of W , d and θ (radians),
(5 marks)
 - ii) If $W = 3$ kN and $d = 15$ mm, simplify the above equation for σ in terms of MPa,
(2 marks)
 - iii) Tabulate the values σ (MPa) as a function of θ (radians) for $0 \leq \theta \leq \pi/2$ at 0.1π interval, and
(4 marks)
 - iv) Using the tabulated values in (iii), Plot the variation of normal stress σ (MPa) in the cable versus θ (radians). . Name axes of the graph and provide graph title.
(4 marks)
- Use Excel or similar for (iii) and (iv)

Final Marks : 10

Due Date: 1 PM, Tuesday, 26 August 2014