بسم الله الرحمن الرحيم

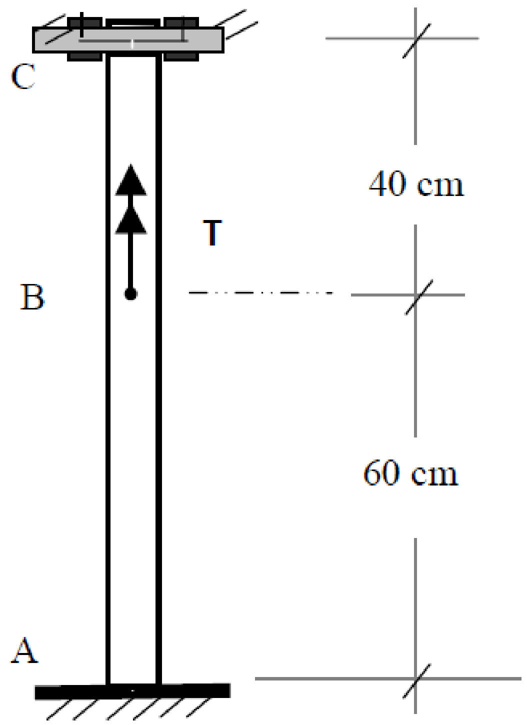
DRAFT FOR YOUR REVIEW

Problem # 1

Shaft ABC has a solid circular cross section with diameter d = 4 cm. The shaft is held fixed at end A while end C allows a rotation angle ϕ of *not* more than 0.02 radians and is subjected to a torque **T** applied at B. For a shaft material with the *given* information:

a) Determine the maximum allowable *torque* **T** *that may* safely be applied.
b) Determine the relative angle of twist $\phi_{C/B}$ corresponding to **T**.

Given: Allowable shear stress $\tau = 50$ **MPa**; G = 70 **GPa**.



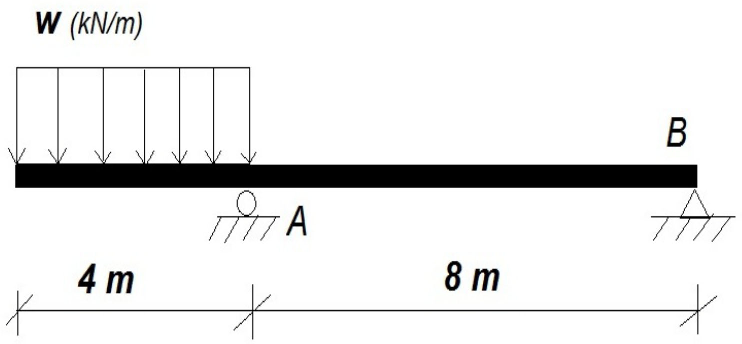
Problem # 4

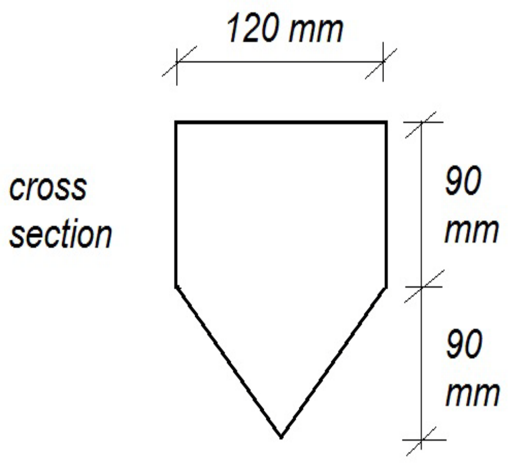
The given beam is subjected to a downward uniformly distributed load **w (kN/m)** as shown.

a) Determine the moment of inertia of the beam's cross section about the Neutral Axis.

b) Determine the maximum value of **w** that can be applied given the following information :

Safety Factor = 2
For tension σ_{ult} *= 30 MPa*
For compression σ_{ult} *= 40 MPa.*



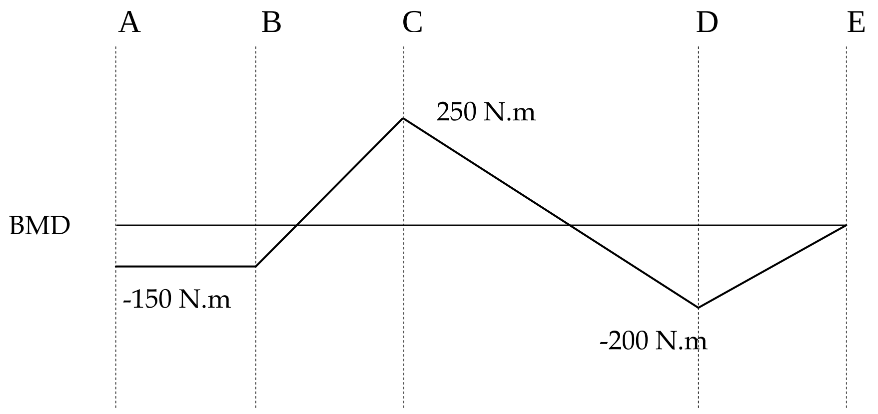


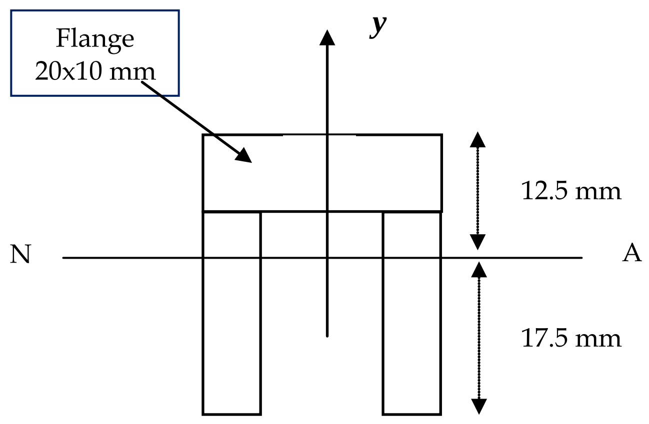
Problem # 5

The bending moment diagram (BMD) and the cross-section of a beam are shown.

a) Sketch the bending stress variation along the y-axis at location B.
b) Determine the resultant force bending stresses produce on the flange at location B.
c) Determine the maximum tensile and compressive stresses in the whole beam and indicate where they act.

Take I = 3 x 10^4 mm^4



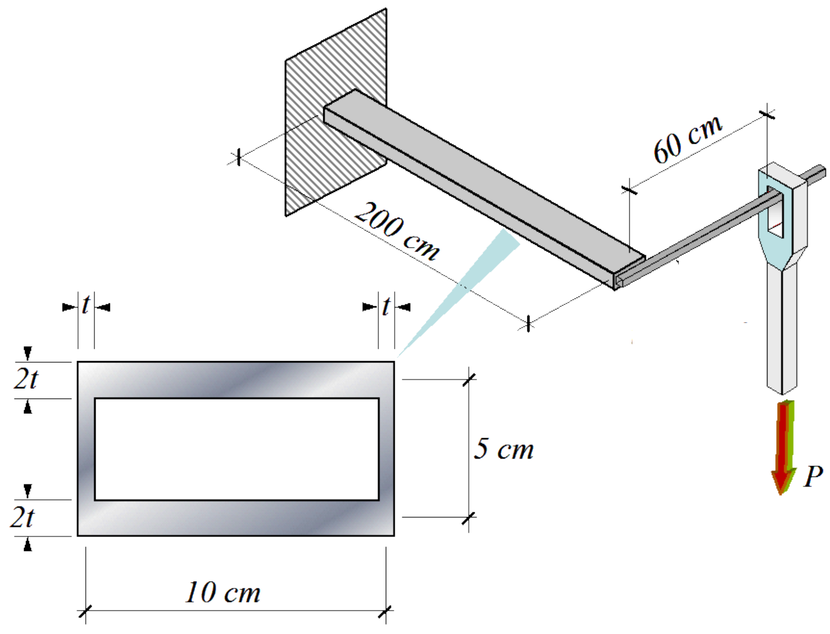


<u>Cross section</u>

Problem # 2

Determine the required thickness, t for the shaft shown below to carry the load P = 12 kN safely. The shaft is made from a material for which the allowable shear stress, τ_{all} =350 MPa and the allowable angle of twist, ϕ_{all} is 2 Degrees.

Given G= 80 GPa



Tube Cross Section

Problem # 3

Draw the **shear force and bending moment diagrams** for the beam shown below using the <u>summation (graphical) method</u>. *Write the degree of the curve on each one.*

The reactions are: **A_y = 50 kN ↑ ; B_y = 20 kN ↓**