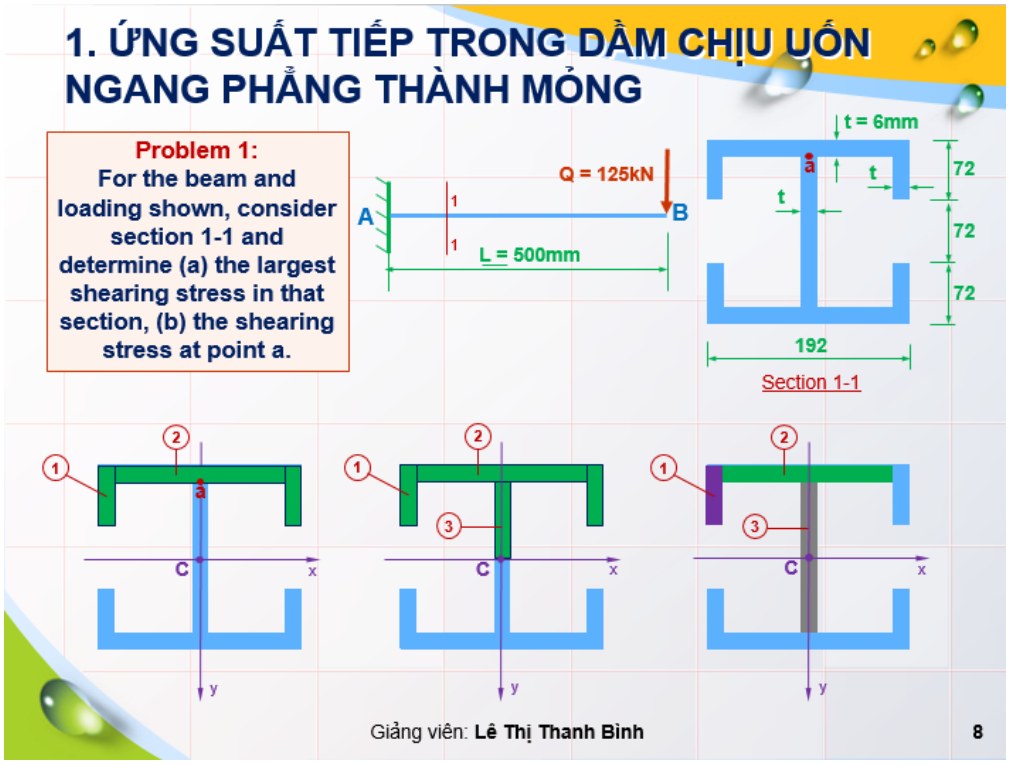
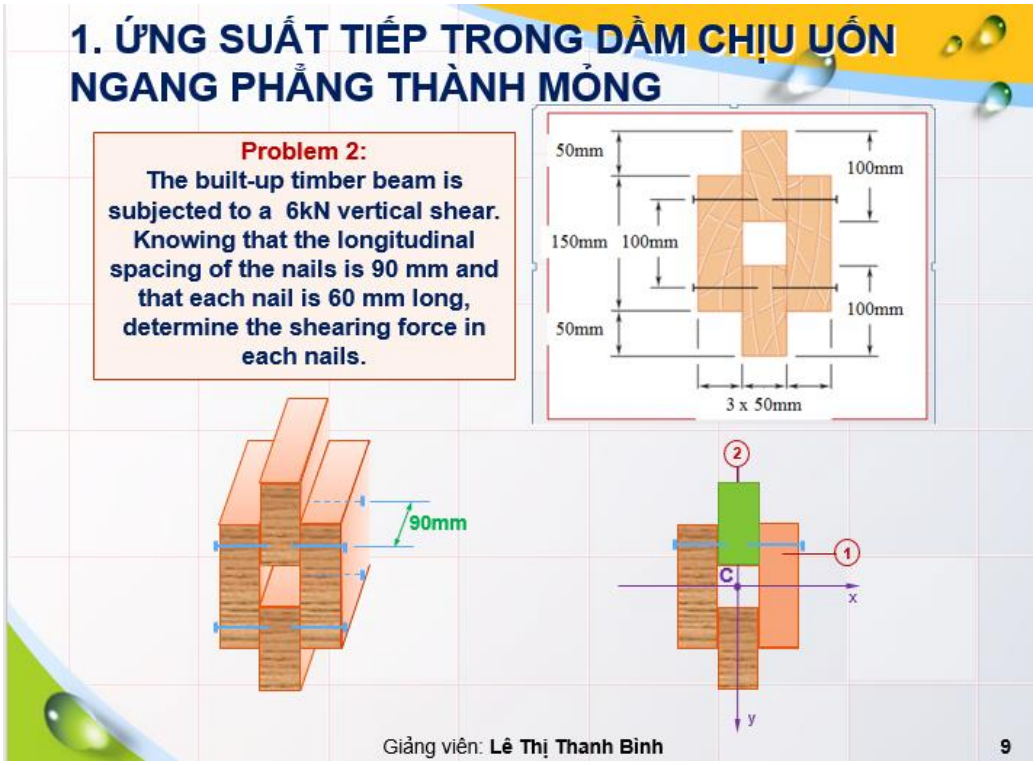
BÀI TẬP SBVL2:

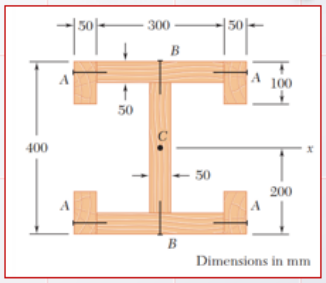
CHƯƠNG 9 – **MỘT SỐ VẤN ĐỀ ĐẶC BIỆT TRONG LÝ THUYẾT UỐN VÀ XOẮN THANH.**



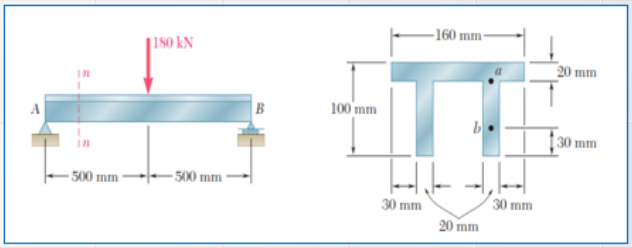


1. ỨNG SUẤT TIẾP TRONG DẦM CHỊU UỐN NGANG PHẲNG THÀNH MỎNG

Problem 3:
The built-up wooden beam shown is subjected to a vertical shear of 8 kN. Knowing that the nails are spaced longitudinally every 60 mm at A and every 25 mm at B, determine the shearing force in the nails (a) at A, (b) at B.

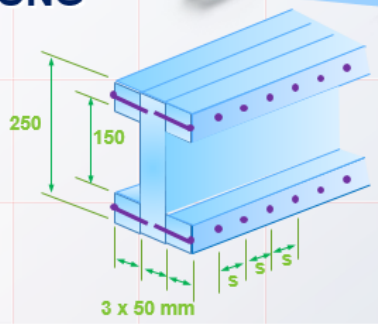


Problem 4:
For the beam and loading shown, consider section n-n and determine (a) the largest shearing stress in that section, (b) the shearing stress at point a and b.

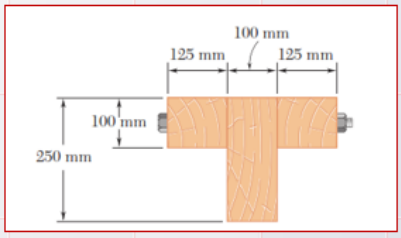


1. ỨNG SUẤT TIẾP TRONG DẦM CHỊU UỐN NGANG PHẲNG THÀNH MỎNG

Problem 5:
The built-up timber beam is subjected to a vertical shear of 5 kN. Knowing that the allowable shearing force in the nails is 300N, determine the largest permissible spacing (s) of the nails.

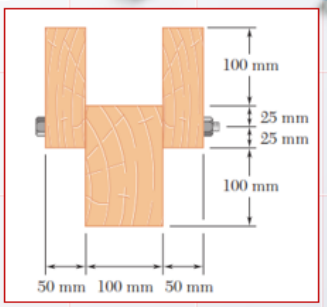


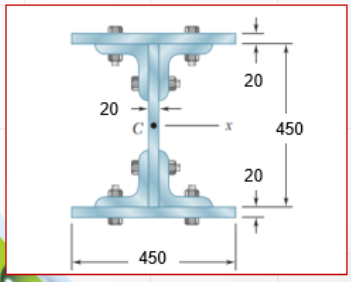
Problem 6:
Three planks are connected as shown by bolts of 14-mm diameter spaced every 150 mm along the longitudinal axis of the beam. For a vertical shear of 10 kN, determine the average shearing stress in the bolts.



1. ỨNG SUẤT TIẾP TRONG DẦM CHỊU UỐN NGANG PHẲNG THÀNH MỎNG

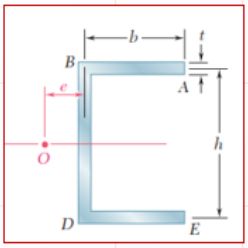
Problem 7:
A beam consists of three planks connected as shown by steel bolts with a longitudinal spacing of 225 mm. Knowing that the shear in the beam is vertical and equal to 6 kN and that the allowable average shearing stress in each bolt is 60 MPa, determine the smallest permissible bolt diameter that can be used.



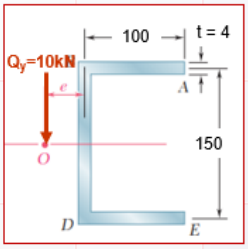


Problem 8:
Two 20 x 450mm steel plates are bolted to four L152 x 152 x 19.0 angles to form a beam with the cross section shown. The bolts have a 22mm diameter and are spaced longitudinally every 125mm. Knowing that the allowable average shearing stress in the bolts is 90MPa, determine the largest permissible vertical shear in the beam. (Given: $I_x = 1896 \times 10^6$ mm^4)

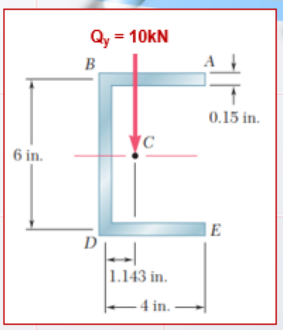
2. TÂM UỐN (SHEAR CENTER)



Problem 9.1



Problem 9.2

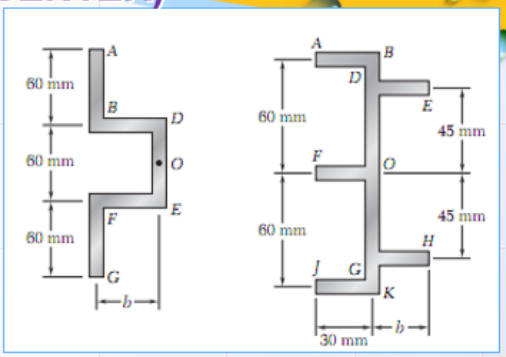


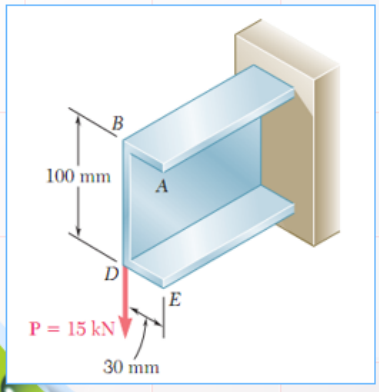
Problem 9.3

Problem 9:
1, Determine the shear center O of a channel section of uniform thickness, knowing that b = 100mm, h = 150mm and t = 4mm.
2, Determine the distribution of the shearing stresses caused by a 10kN vertical shear Q_y applied at the shear center O.
3, Determine the maximum shearing stress caused by a 10kN vertical shear Q_y applied at the centroid C of the section.

2. TÂM UỐN (SHEAR CENTER)

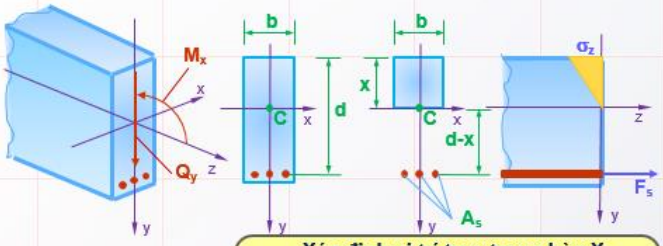
Problem 10:
A thin-walled beam of uniform thickness has the cross section shown. Determine the dimension b for which the shear center O of the cross section is located at the point indicated.





Problem 11:
A steel plate, 160 mm wide and 8 mm thick, is bent to form the channel shown. Knowing that the vertical load P acts at a point in the midplane of the web of the channel, determine (a) the torque T that would cause the channel to twist in the same way that it does under the load P, (b) the maximum shearing stress in the channel caused by the load P.

3. UỐN DẦM GỒM NHIỀU LỚP VẬT LIỆU.
(BENDING OF BEAMS MADE OF SEVERAL MATERIALS)

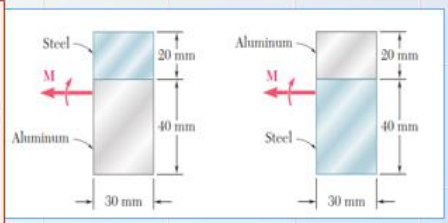


Xác định vị trí trục trung hòa X.
(Determine the location of the neutral axis X)

$E_1.S_x^1 + E_2.S_x^2 = 0$

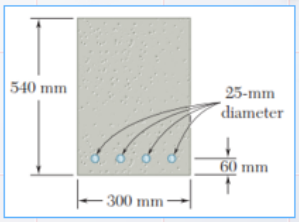
$1/2b.x^2 + n.A_s.x - nA_s.d = 0$

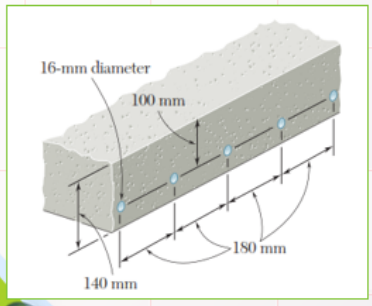
Problem 12:
A steel bar and an aluminum bar are bonded together to form the composite beam shown. The modulus of elasticity for aluminum is **70GPa** and for steel is **200 GPa**. Knowing that the beam is bent about a horizontal axis by a couple of moment **M=1500 N.m**, determine the maximum stress in (a) the aluminum,(b) the steel.



3. UỐN DẦM GỒM NHIỀU LỚP VẬT LIỆU.
(BENDING OF BEAMS MADE OF SEVERAL MATERIALS)

Problem 13:
The reinforced concrete beam shown is subjected to a positive bending moment of **175 kN.m.** Knowing that the modulus of lasticity is **25 GPa** for the concrete and **200 GPa** for the steel, determine (a) the stress in the steel, (b) the maximum stress in the concrete.

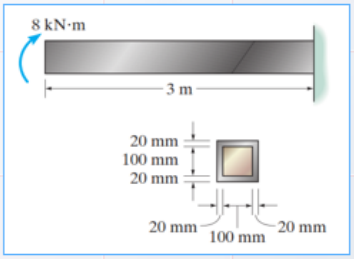


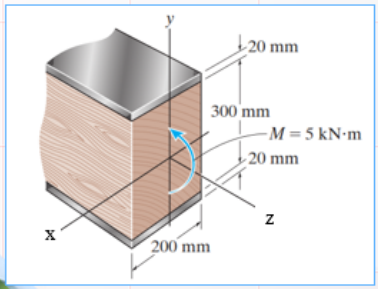


Problem 14:
A concrete slab is reinforced by 16-mm-diameter steel rods placed on 180-mm centers as shown. The modulus of elasticity is 20 GPa for the concrete and 200 GPa for the steel. Using an allowable stress of 9 MPa for the concrete and 120 MPa for the steel, determine the largest bending moment in a portion of slab 1 m wide.

3. UỐN DẦM GỒM NHIỀU LỚP VẬT LIỆU.
(BENDING OF BEAMS MADE OF SEVERAL MATERIALS)

Problem 15:
The member has a brass core bonded to a steel casing. If a couple moment of 8 kN m is applied at its end, determine the maximum bending stress in the member. E_{br} = 100GPa, E_{st} = 200GPa.



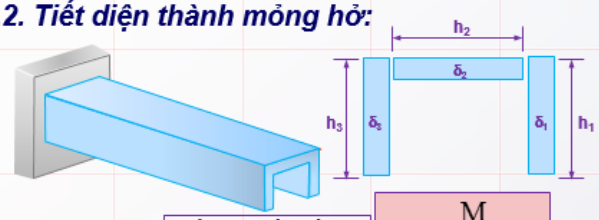


Problem 16:
A wood beam is reinforced with steel straps at its top and bottom as shown. Determine the maximum bending stress developed in the wood and steel if the beam is subjected to a bending moment of *M = 5 kN.m. Sketch* the stress distribution acting over the cross section. Take E_w = 11GPa, E_{st} = 200GPa.

4. XOAN DAM TIET DIỆN THANH MONG.

(TORSION OF THIN-WALLED BEAM)

4.2. Tiết diện thành mỏng hở:



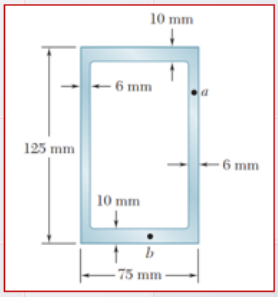
Góc xoắn
(Angle of twist)

$$\theta = \frac{M}{\frac{1}{3}G.\sum h_i.\delta_i^3} = \frac{M}{G.I_{x_0}}$$

Ứng suất tiếp
(Shearing stress)

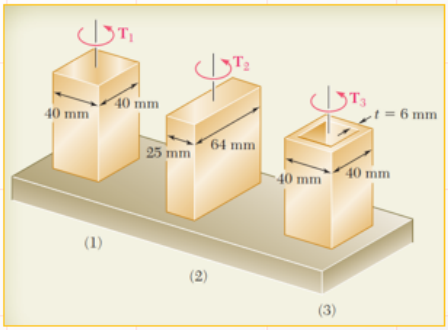
$$\tau_{max} = \frac{M}{I_{x_0}}.\delta_{max}$$

Problem 17:
A torque **M_z = 5 kN.m** is applied to a hollow shaft having the cross section shown. **Neglecting the effect of stress concentrations, determine the shearing stress at points (a) and (b).**



4. XOAN DAM TIET DIỆN THANH MONG.

(TORSION OF THIN-WALLED BEAM)



Problem 18:
Using **τ = 40 MPa, determine the largest torque that may be applied to each of the brass bars and to the brass tube shown**. Note that the two solid bars have the same crosssectional area, and that the square bar and square tube have the same outside dimensions.

Problem 19:
A 4-m-long steel member has a **W310x60** cross section. Knowing that **G = 77.2 GPa** and that the allowable shearing stress is 40 MPa, determine (a) the largest torque **M_z that can be applied, (b) the corresponding** angle of twist. Refer to Appendix C for the dimensions of the cross section and neglect the effect of stress concentrations.