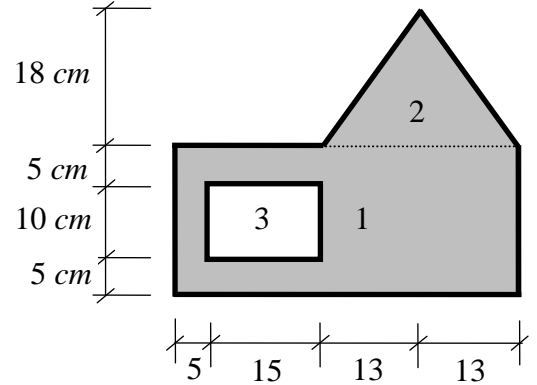
	Ministry of Higher Education Giza Higher Institute for Eng. & Tech. Civil Engineering Department	Academic Year : 2016/2017 Semester : Second Level : 2nd
	Course Name: Theory of Structures (2)	Time : 3 Hours
	Course Code : CIV 202	Date : 28 / 5 / 2017
	Final Term Exam	
	Total Marks: 60	No. of Questions: 5

Question (1): (12 Marks)

For the shown cross-section, determine the following:

- The location of the centroid.
- The moments of inertia about the centroidal axes.
- The direction of the principal axes.
- The principal moments of inertia.

Note: Divide the cross-section to 3 elements as shown on the figure.

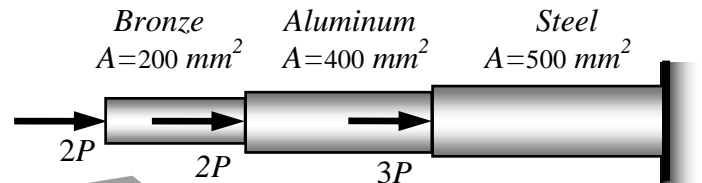


Question (2): (12 Marks)

A rod of variable cross-section is subjected to axial loads as shown. Determine the maximum safe value of axial load P .

Given Data:

- Allowable stress for bronze = 100 MPa
- Allowable stress for aluminum = 90 MPa
- Allowable stress for steel = 140 MPa

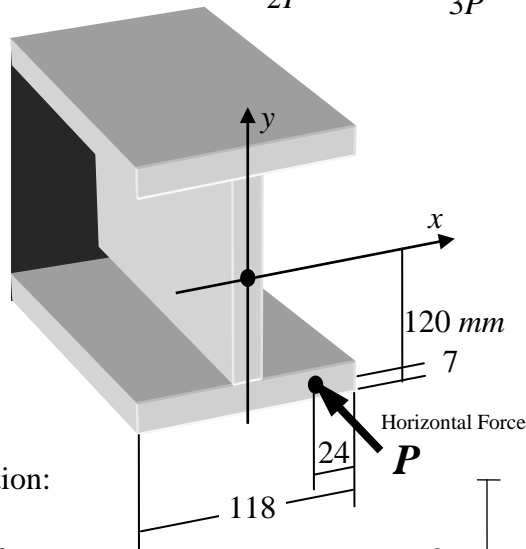


Question (3): (12 Marks)

A horizontal force P is applied as shown to a I-section. The properties of the I-section are:

- Area, $A = 4806 \text{ mm}^2$
- Section Modulus, $Z_x = 406 \times 10^3 \text{ mm}^3$
- Section Modulus, $Z_y = 48 \times 10^3 \text{ mm}^3$

Determine the largest permissible force P if the compressive stress in the member is not to exceed 80 MPa. Neglect the member weight.



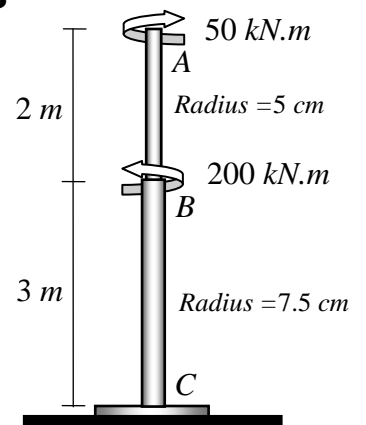
Question (4): (12 Marks)

For the shown column of variable circular cross-section:

- Draw the twisting moment diagram.
- Determine the maximum shear stress in each part (AB and BC).
- Determine the angle of twist ϕ of section A with respect to the fixed support at C.

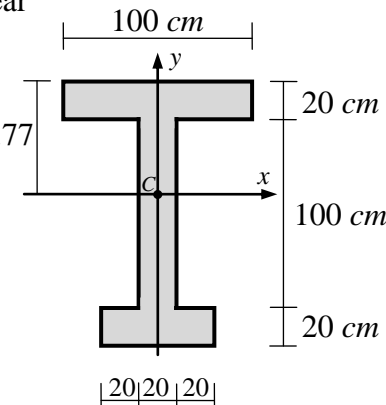
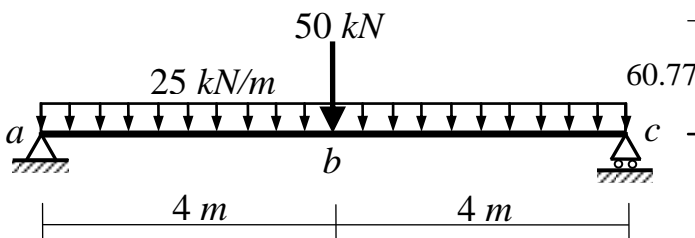
$G = 8000 \text{ kN/cm}^2$

$\tau = \frac{Tr}{J}$ and $\phi = \frac{TL}{JG}$



Question (5): (12 Marks)

For the shown beam, calculate and draw the shear stress distribution over the cross-section at a .



Cross-section of the beam