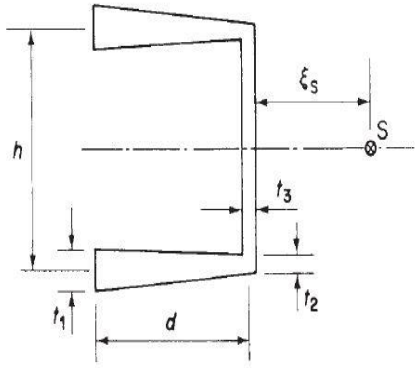
Assignment-4

Problem_1:

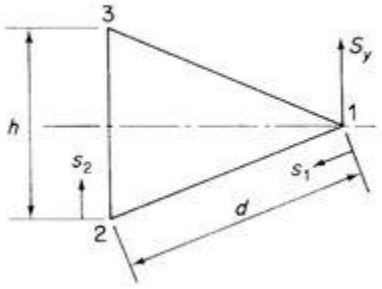
A thin-walled beam has the cross-section shown



The thickness of each flange varies linearly from t_1 at the tip to t_2 at the junction with the web. The web itself has a constant thickness t_3. Calculate the distance ξ_S from the web to the shear center S.

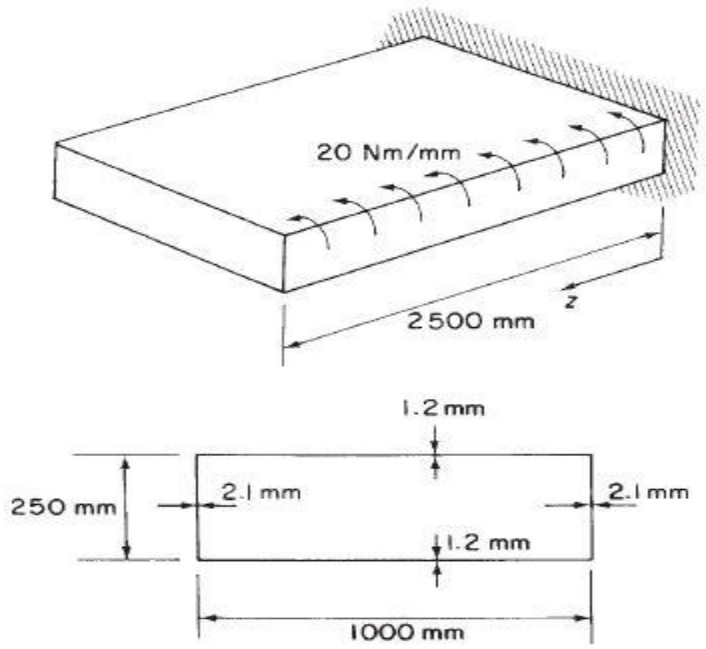
question 2:

A uniform thin-walled beam of constant wall thickness t has a cross-section in the shape of an isosceles triangle and is loaded with a vertical shear force S_y applied at the apex. Assuming that the distribution of shear stress is according to the basic theory of bending, calculate the distribution of shear flow over the cross-section. Illustrate your answer with a suitable sketch, marking in carefully with arrows the direction of the shear flows and noting the principal values.



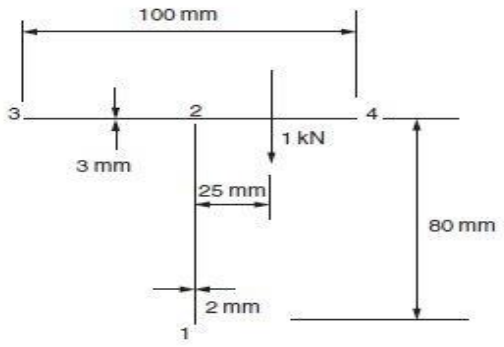
Question: 3

A uniform, thin-walled, cantilever beam of closed rectangular cross-section has the dimensions shown in Fig. P.18.1. The shear modulus G of the top and bottom covers of the beam is 18 000 N/mm^2 while that of the vertical webs is 26 000 N/mm^2.



Question 4:

Determine the maximum shear stress in the beam section shown in Fig. stating clearly the point at which it occurs. Determine also the rate of twist of the beam section if the shear modulus G is 25 000 N/mm^2.



Question 5:

Determine the torsional stiffness of the four-cell wing section shown in **figure below**

Data:

Wall	12	23	34					
	78	67	56	45°	45^{i}	36	27	18
Peripheral length (mm)	762	812	812	1525	356	406	356	254
Thickness (mm)	0.915	0.915	0.915	0.711	1.220	1.625	1.220	0.915

Cell areas (mm^2) $A_I = 161\,500$ $A_{II} = 291\,000$
$A_{III} = 291\,000$ $A_{IV} = 226\,000$