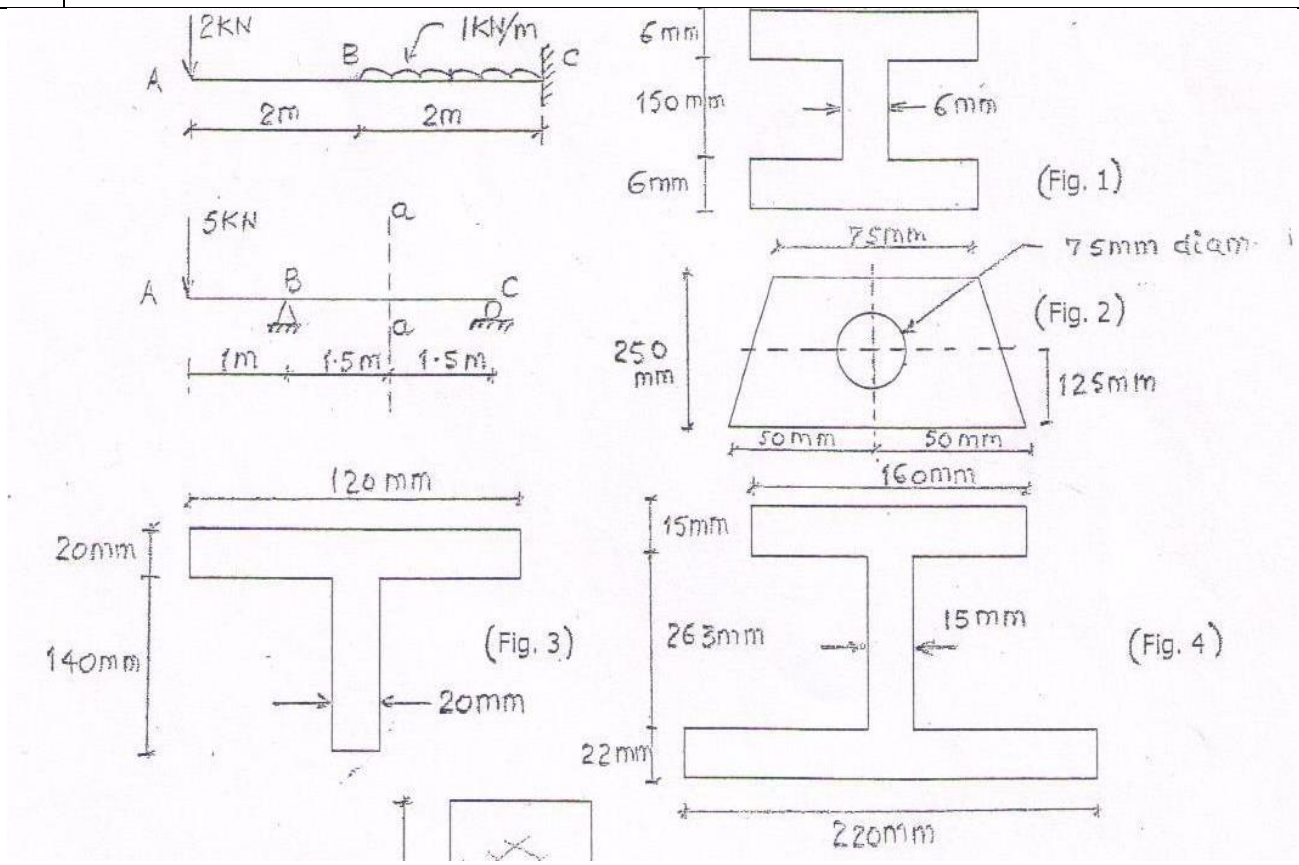
THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY, PATIALA
UES 017: SOLIDS AND STRUCTURES

B.E. – Second Year **Session: 2020-2021**
Tutorial Sheet No. 7 **(Bending stresses)**

1.	Find the maximum tensile and compressive stresses at a section of a cantilever at a distance of 3 m from the left end (Fig. 1).
2.	Find the maximum tensile and compressive stresses at the section a-a of an overhanging beam (Fig. 2).
3.	A cast iron pipe having a bore of 600 mm and wall thickness 40 mm is simply supported over a span of 4 m. Find the intensity of maximum bending stress when it is full of water. Density of cast iron = 70 kN/m^3 and density of water = 10 kN/m^3.
4.	Locate the neutral axis and calculate the value of I_{ZZ} for the T section as shown in Fig. 3. Determine stresses at top and bottom if the applied moment is 60kNm. (Assume tension at bottom).
5.	A CI beam of I section (Fig. 4) is simply supported over a span of 5 m. If the permissible stresses are 80 N/mm^2 in compression and 30 N/mm^2 in tension, what UDL can be safely applied on the beam?



THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY, PATIALA
UES 010: SOLIDS AND STRUCTURES

B.E. – Second Year **Session: 2020-2021**
Tutorial Sheet No. 8 **(Shearing stresses in beams)**

1.	The **three beam sections shown in Fig. 1,** are subjected to a shear force of 80 KN. Draw the shear stress diagram along the depth. Also find the ratio of maximum to mean shear stress.
2.	A steel beam of I-section is 600mm deep. Each of the flanges is 250mm wide and 25 mm thick. The web is 15 mm thick. The beam section is subjected to a shear force of 500 kN. Determine the shear stress distribution for the beam section when the web is horizontal.
3.	Three boards, (**Fig. 2**) each of 40 mm x 90 mm rectangular cross-section are nailed together to form a beam which is subjected to a vertical shear force of 1 kN. Determine the shear stress at the junction of the two boards. If the spacing between each pair of nails is 60 mm, determine the shearing force in each nail.
4.	The manufactured wood beam carries the concentrated loads as shown in **Fig. 3**. What is the maximum safe value of w_0 if the working stress is 10 MPa in bending and 2.0 MPa in shear.
5.	A beam AB supported at its ends has a span of 3 m and caries a point load of 15 kN at 2m from left support. The cross-section of the beam is as shown **in Fig. 4.** Sketch the maximum shear stress distribution in the beam marking the principal values. Also find the ratio of maximum to mean shear stress.
6.	A timber beam carries a uniformly distributed load of 15kN/m (including self weight) over its entire span of 4 m. If the permissible stresses for timber are 12 MPa in compression, 10 MPa in tension, and 0.8MPa in shear, design a suitable rectangular beam. Take the width of the rectangular beam as one third the depth.

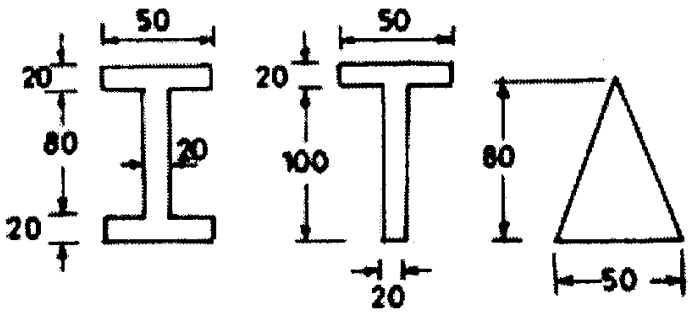


Fig. 1

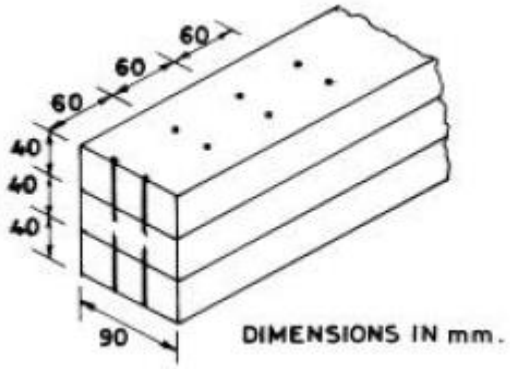


Fig. 2

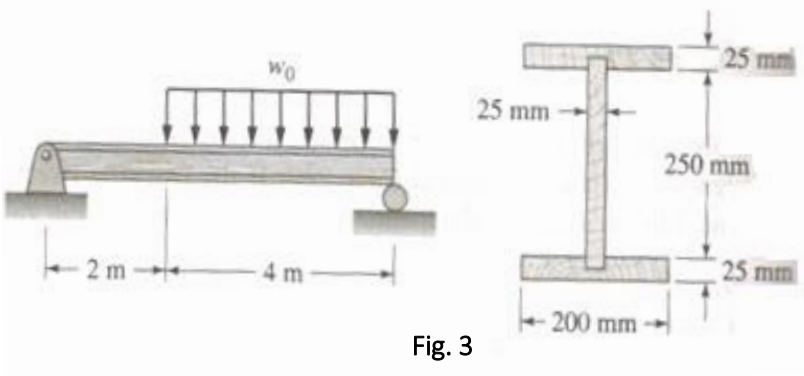


Fig. 3

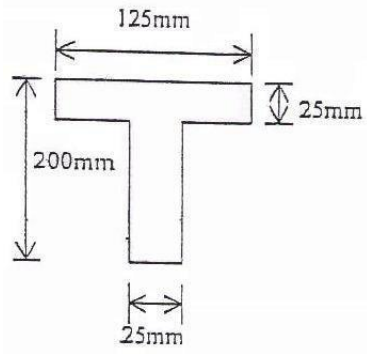


Fig. 4