



ANSWER AS MUCH AS YOU CAN

Q1) For the beam with cantilever shown in Figure 1-a . Assuming allowable shear stress for bolts = 0.96 t/cm^2 , allowable bearing stress for plates = 2.2 t/cm^2 and the diameter of bolts = 2 cm.
 (25 Marks) (ILOS a-3, b-1, c-2)

A- For connection shown in Figures 1-a and 1-b. Check safety for all groups of bolts.

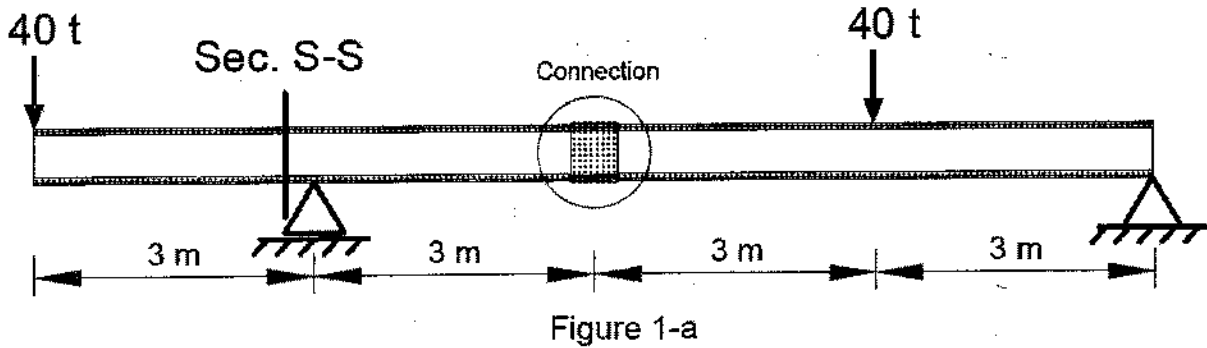


Plate thickness = 0.02 m

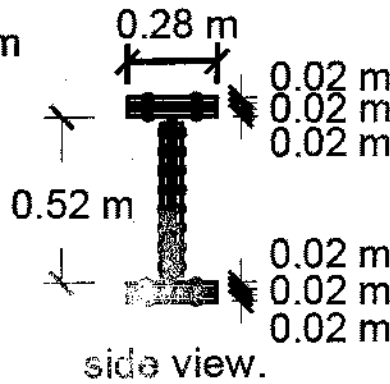
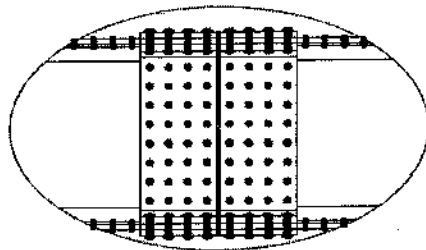
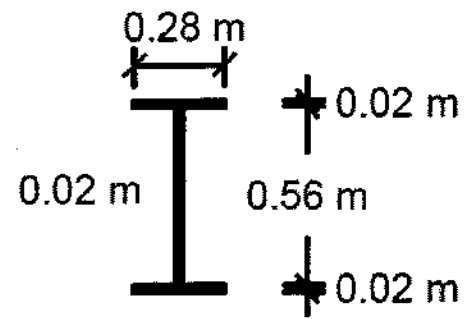
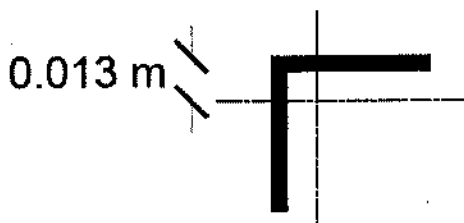


Figure 1-b

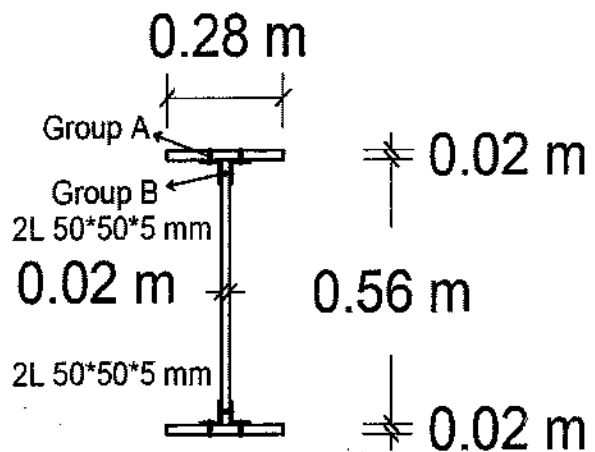


B- At section S-S and considering the cross section shown in Figure 1-c. Plot the normal and shear stress distributions and calculate the percentage moment and percentage shear carried by the flanges and web respectively.

C- For built-up section shown in Figure 1-d. Specify the proper pitch required for the two groups of rivets (group A and B).



For one angle $A = 4.75 \times 10^{-4} \text{ m}^2$, $I_x = 1.125 \times 10^{-7} \text{ m}^4$



Q2) Determine the location of e of the shear center for the beam having the cross sectional dimensions shown in Figure 2. (10 Marks) (ILOS a-3, b-1, c-2)

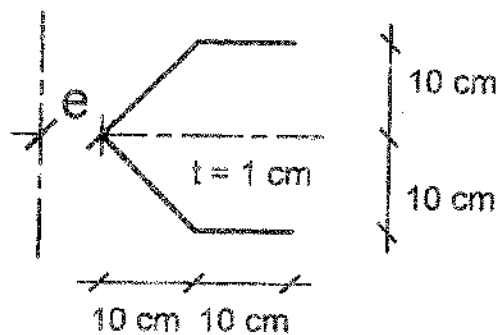


Figure 2

Q3) For the R.C section jacketed with 2 cm steel plates shown in Figure 3. If the beam having length 2.0m, $G_{\text{CONCRETE}} = 80 \text{ t/cm}^2$, $G_{\text{STEEL}} = 800 \text{ t/cm}^2$ and the allowable stresses are: 9.8 kg/cm^2 for concrete and 840 kg/cm^2 for steel. Find the safe torsional moment. (Dimensions of the R.C section only $30 \text{ cm} \times 60 \text{ cm}$). (10 Marks) (ILOS a-3, b-1, c-2)

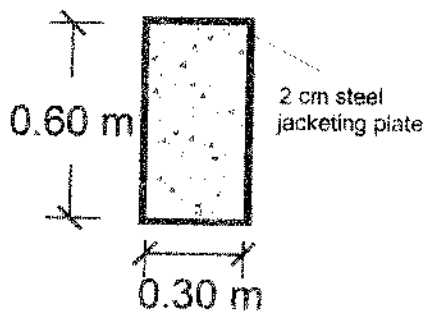


Figure 3

Q4) For the beam with rectangular cross section $0.3 \times 0.6 \text{ m}$ shown in Figure 4. If $M_t = 5 \text{ m.t}$, $P = 10 \text{ t}$ and $G = 80 \text{ t/cm}^2$. Indicate on small elements the stresses components at points 1, 2 and 3. Then for point 2 only find the principal normal stresses and their planes and the associated shear stresses. (10 Marks) (ILOS a-3, b-1, c-2)

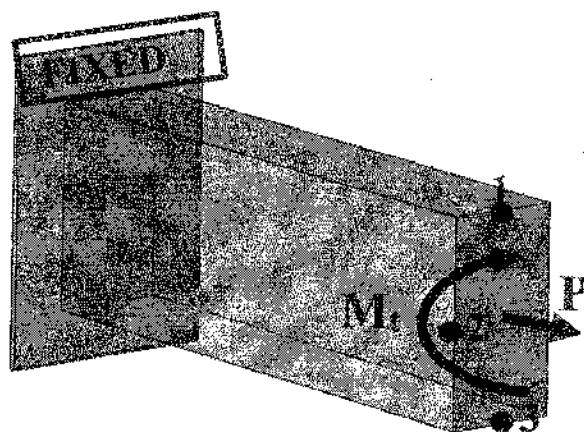


Figure 4

Q5) Using the three methods (Double Integration Method, Conjugate Beam Method and Moment Area Method). Find deflections and rotations at points b, c and d for beam shown in Figure 5, also find relative rotation at b. Finally draw elastic line. Take $E = 2 \times 10^6 \text{ t/m}^2 \cdot \text{l} = 0.002 \text{ m}^4$. (30 Marks) (ILOS a-3, b-1, c-2)

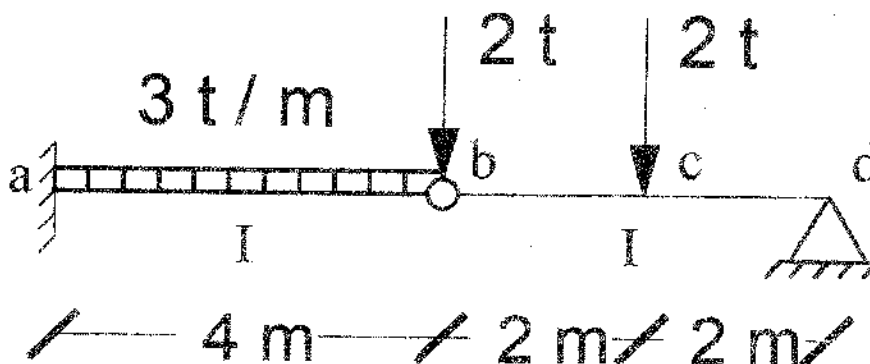


Figure 5

& With my best wishes &

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