

ANSWER AS MUCH AS YOU CAN

يرجاء الحل بترتيب الأسئلة وتنظيم الحل مهم جدا

(ILOS a-1, a-3, b-1, b-2, c-2, c-6)

For all questions ($E = 20000000 \text{ t/m}^2$, $I = 6.75 \times 10^{-4} \text{ m}^4$).

Q1) Using four methods (DOUBLE INTEGRATION METHOD, CONJUGATE BEAM METHOD, MOMENT AREA METHOD and VIRTUAL WORK METHOD), Calculate deflections and rotations for all points for the beam shown in Figure 1 and draw the elastic curve.

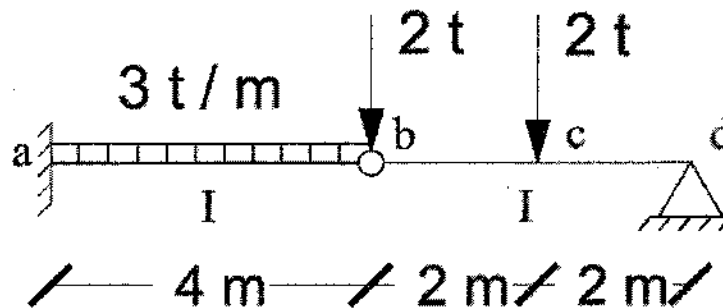


Figure 1

Q2) For structure shown in Figure 2 and using Virtual Work Method. Find the horizontal deflection, vertical deflection and relative rotation at point d, rotations at points a and b. then, Draw the elastic line.

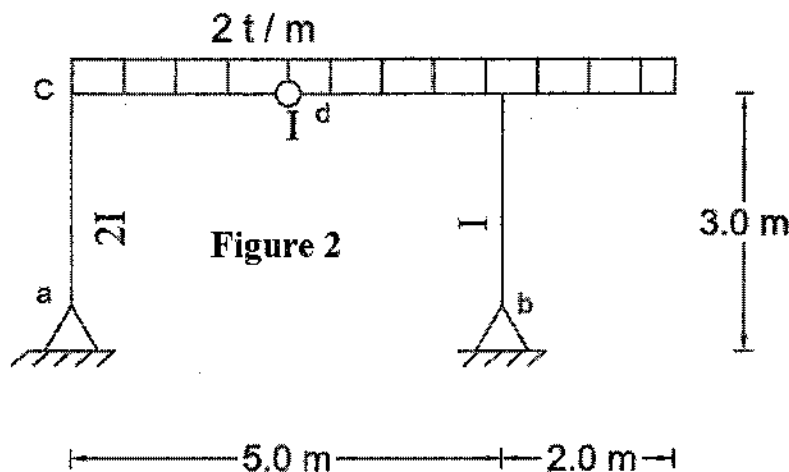


Figure 2

Q3) For the shown bracket it is required to find the maximum value of load (P) so that the maximum shear stress in bolts doesn't exceed 0.9 t/cm^2 , Take bolts diameter 2 cm.

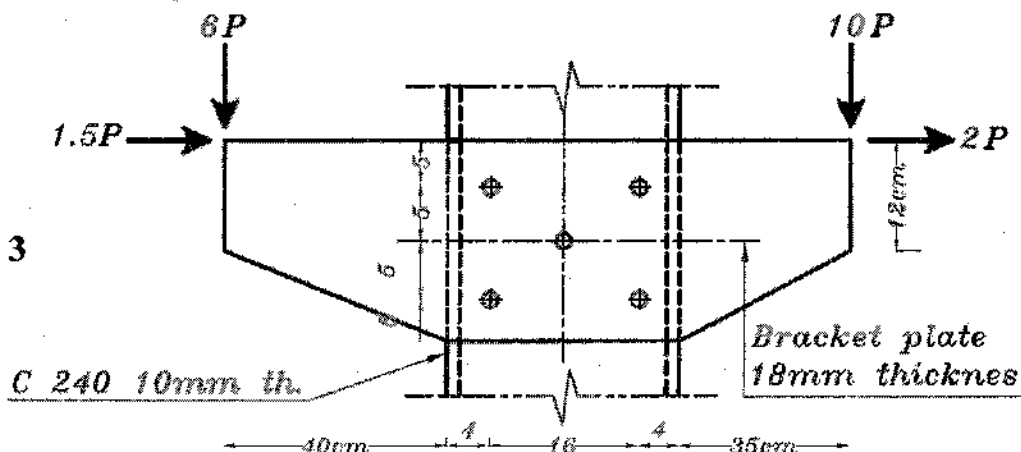


Figure 3

Q4) A- Find the maximum pitch (P) of the two groups of rivets shown in figure such that the shear stress in the rivets not exceeded 0.96 t/cm^2 with diameter 2.2 cm and the maximum bearing stress does not exceed 2.8 t/cm^2

B- What is the distance from the left support that make pitch ($1.5 P$) safely used?

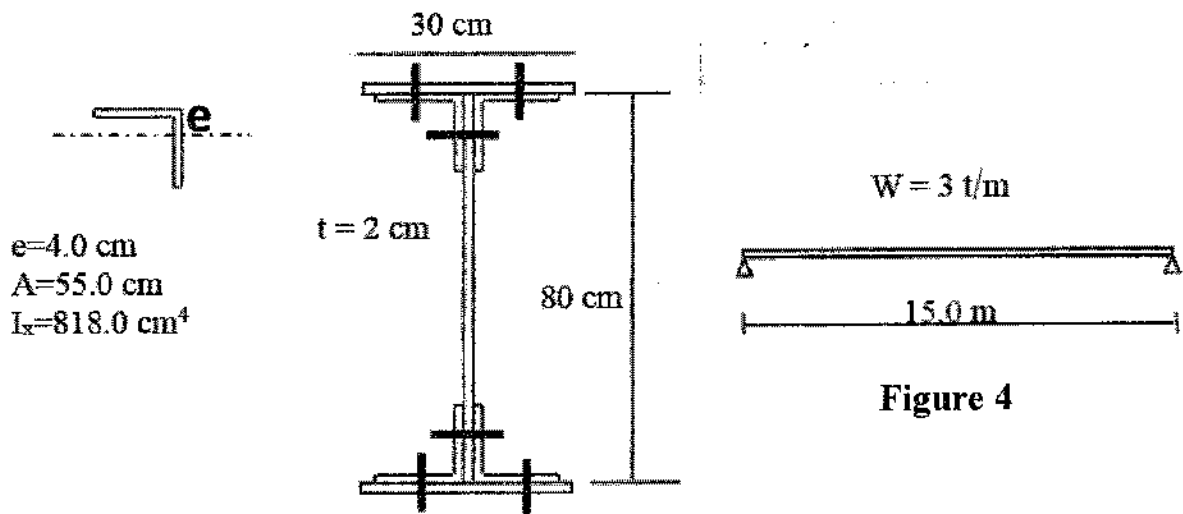


Figure 4

Q5) For the beam with cantilever shown in Figure 5-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 .

A- For connection shown in Figures 5-a and 5-b. Check safety for all groups of bolts.

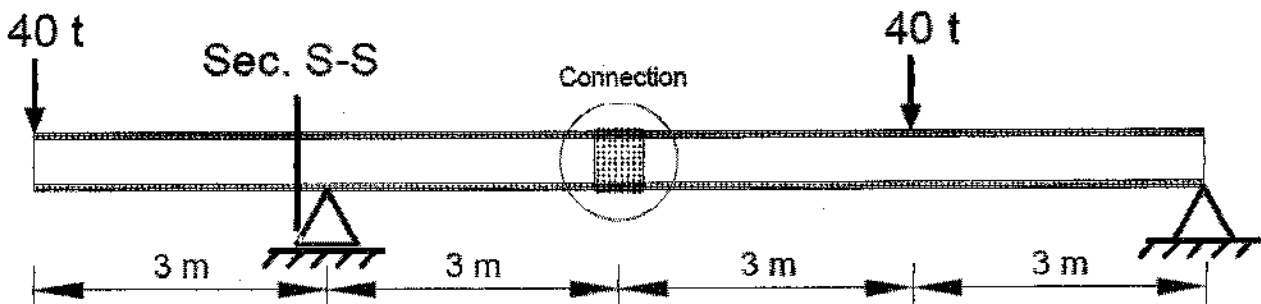
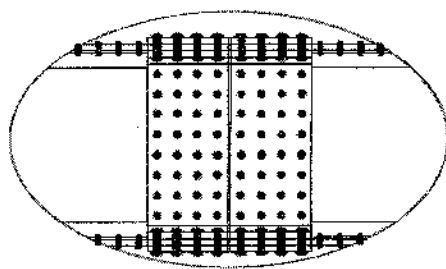
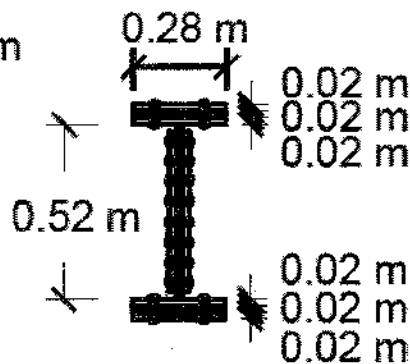


Figure 5-a

Plate thickness = 0.02 m



Elevation.



side view.

Figure 5-b

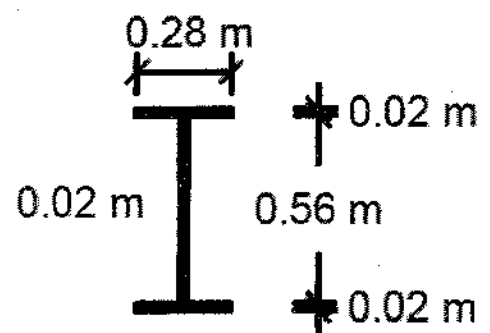


Figure 5-c

B- At section S-S and considering the cross section shown in Figure 5-c. Plot the normal and shear stress distributions and calculate the percentage moment and percentage shear carried by the flanges and web respectively, what is your comment?.

& With my best wishes & DR. Galal Elsamak