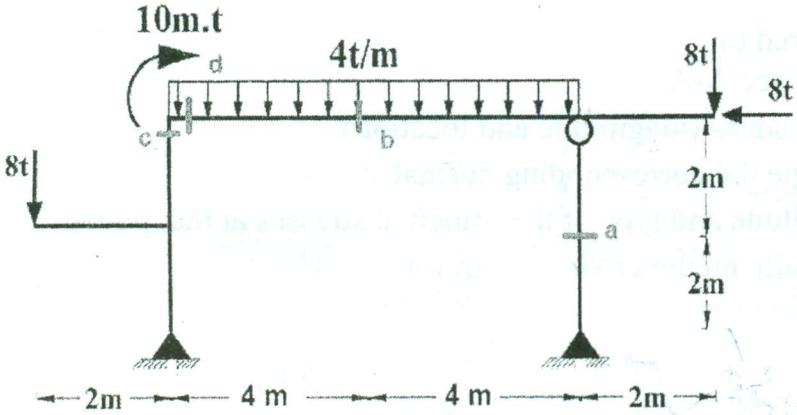
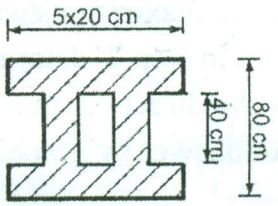
Faculty of Engineering at Mataria	HELWAN UNIVERSTY	1 st / 2 nd	Semester Academic Year 2020/2021
Civil Department		Exam Type (Mid/**Term**): **Term**	
Course Name: **Structural Analysis (2)**		Date of Exam: **14th June 2021**	
Course Code: CV4123		Time Allowed: **3** Hours	
First year		Maximum Mark: 60	

Question No. (1) (30%)

For the shown frame, it's required to:

1- Draw all internal forces (N.F.D, S.F.D and B.M.D).
2- Draw normal stress distribution (N.S.D) at sections for (a, b, c).
3- Draw the shear stress distribution (S.S.D) at section (c, d).



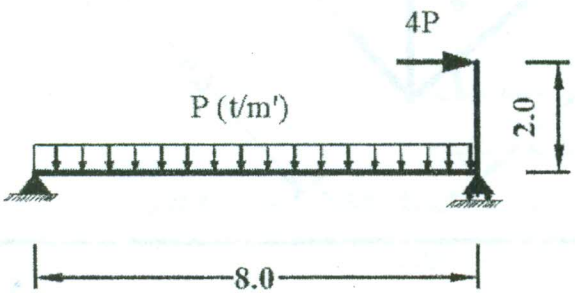


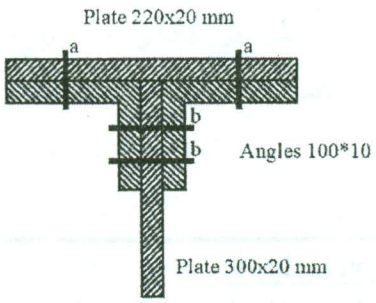
Sec. b, c, d

Sec. a

Question No. (2) (20%)

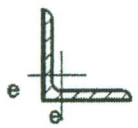
For the shown beam, calculate the value of P such that the allowable shear stress for rivets is 0.95 t/cm^2 where the spacing between rivets = 15 cm the diameter of rivet is 22 mm).





Beam Cross-section

For Angle 100*10



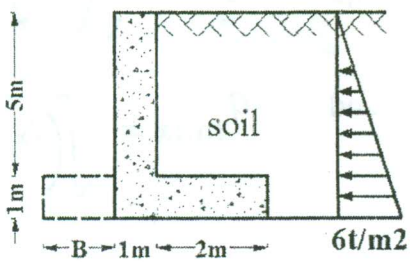
A = 19.2 cm^2
e = 2.82 cm
I_x = 176.7 cm^4
I_y = 176.7 cm^4

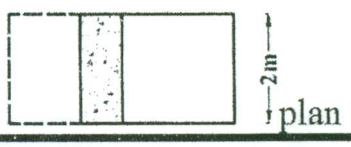
Question No.(3) (15%)

For the shown retaining wall, it's required to:

1- Check **stresses** for this wall. (**Note: B=0**).
2- If the wall was **unstable**, calculate the minimum extended length (B) for the base **to be safe.**

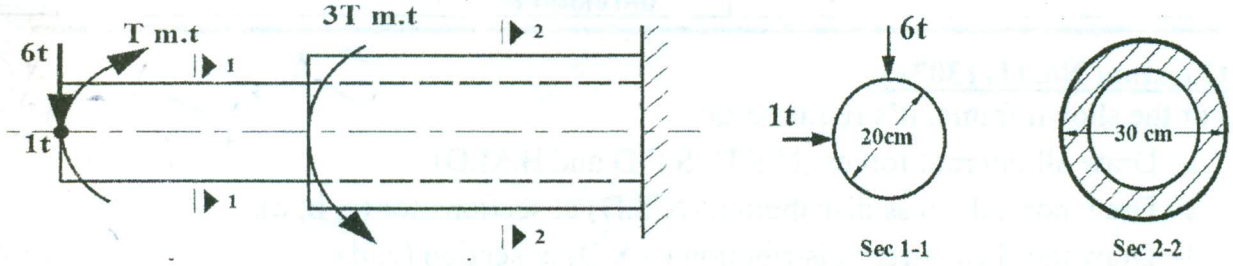
Note: unite weight for concrete and soil =2.5t/m^3 and 1.5 t/m^3 respectively.





Question No.(4) (20%)

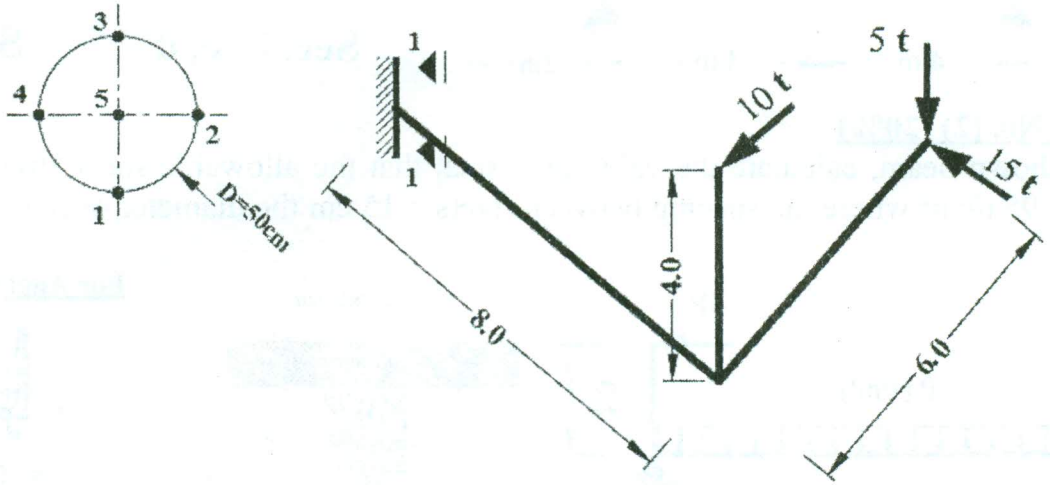
For the shown shaft applied to torsion moment, calculate the maximum torsion T (m.t) if the allowable shear stress is 0.2 t/cm2. Then, Calculate the total twist angle at free end is. (G=400 t/cm^2)



Question No.(5) (15%)

For the shown structure, it is required to:

1- Determine all internal forces at sec A-A.
2- Determine the maximum shear stress (magnitude and location).
3- At that point in step 2, determine the corresponding normal stress.
4- Determine the direction, magnitude and type of the principal stresses at that point.
5- Check your answer by graphically method (Mohr's circle).



****Some useful relations:**

The principle stresses at any point in terms of its components are given by:

$$F_{1,2} = \frac{f_x + f_y}{2} \pm \sqrt{\left(\frac{f_x + f_y}{2}\right)^2 + q^2} \quad , \quad \tan(2\theta) = \frac{-2q}{f_x - f_y}$$

and $$q_{max.} = \sqrt{\left(\frac{f_x + f_y}{2}\right)^2 + q^2} \qquad f_{av} = \frac{f_x + f_y}{2}$$

BEST WISHES
Ass. Prof./ Essam Ghonem
Ass. Prof./ Mohammed Helmy
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