

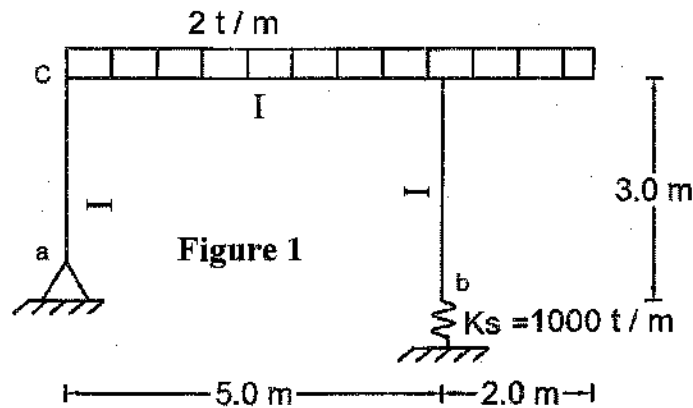
ANSWER AS MUCH AS YOU CAN

برجاء الحل بترتيب الأسئلة وتنظيم الحل مهم جدا

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

For all questions ($E = 20000000 \text{ t/m}^2$, $\alpha = 1 \cdot 10^{-5} / ^\circ\text{C}$).

Q1) A- For structure shown in Figure 1 and using Virtual Work Method. Find the horizontal and vertical deflections at points c and b and rotation at point a. then, Draw the elastic line. Take $I = 6.75 \cdot 10^{-4} \text{ m}^4$.



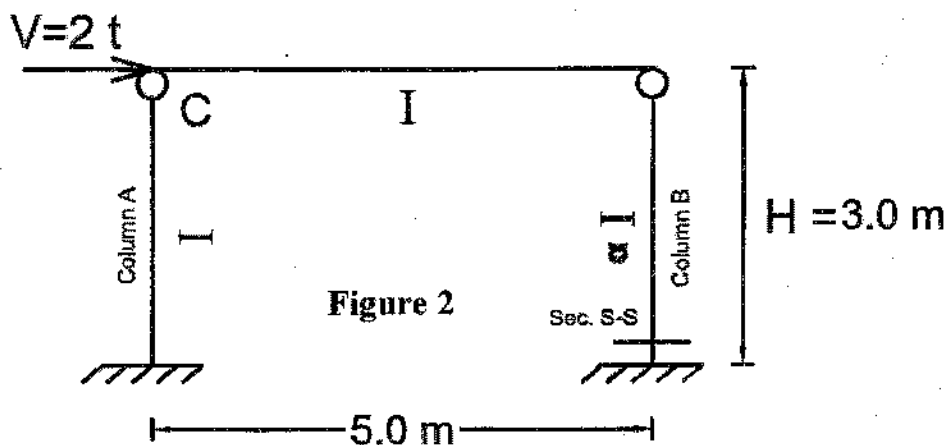
B – For structure shown in Figure 2 and using Consistent Deformation Method

1- Draw S.F.D and B.M.D in cases of $\alpha = 1$ and $\alpha = 1000$ if $I = 6.75 \cdot 10^{-4} \text{ m}^4$.

2- In each case, what is the ratio between the moment resisted by section S-S to the overall bending moment on the frame (The overall B.M. = $V \cdot H = 2 \cdot 3 = 6 \text{ t.m}$)?

3- In each case, what is the ratio between the shear resisted by section S-S to the overall shear on the frame (The overall shear = $V = 2 \text{ t}$)?

4- In case of $\alpha = 1000$, what is the ratio between the horizontal deflection of point C to the value of deflection resulted from $\frac{VH^3}{3E(\alpha I)}$ formula.

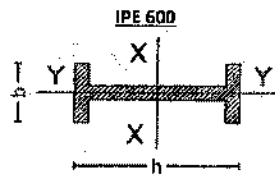


Q2) For frame shown in Figure 3.

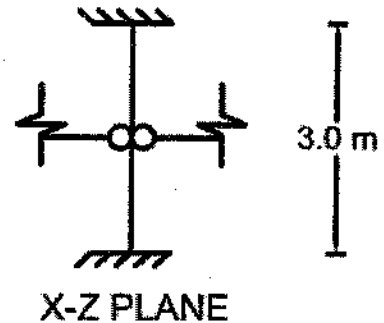
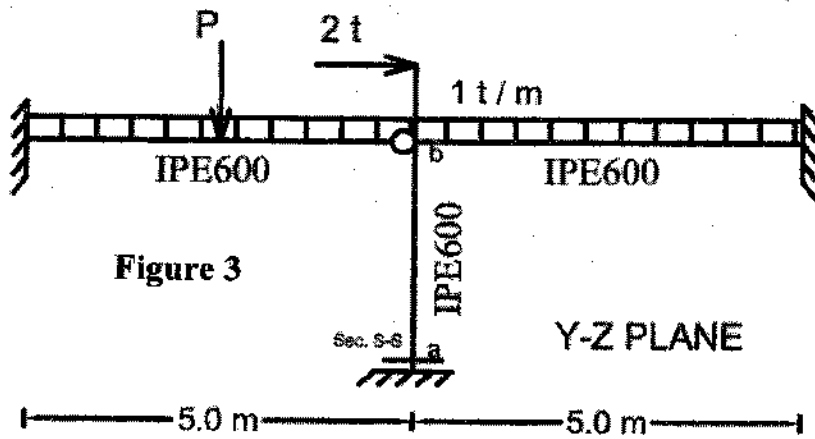
A- Using method of Three Moments Equation, Draw N.F.D and B.M.D.

B- Assuming steel type 52, Find the value of load P such that the maximum allowable stresses in the column ab at the marked section should not be exceeded (Take the effect of buckling into consideration).

IPE 600	
$h = 60 \text{ cm}$	$I_x = 92080 \text{ cm}^4$
$b = 22 \text{ cm}$	$I_y = 3390 \text{ cm}^4$
$A = 156 \text{ cm}^2$	



K The least of	$0.7 + 0.05(G_A + G_B)$
	$0.85 + 0.05 G_{min}$
$K \leq 1.0$	



Q3) A- Calculate the yield load (P_y), the plastic load (P_p), the corresponding displacements at mid span and draw the load displacement curve for the shown beam. Note: the cross section is given (Take $\sigma_y = 24000 \text{ t/m}^2$)

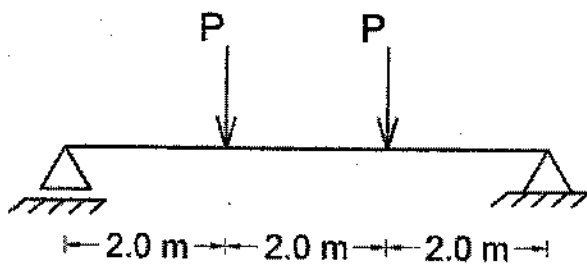
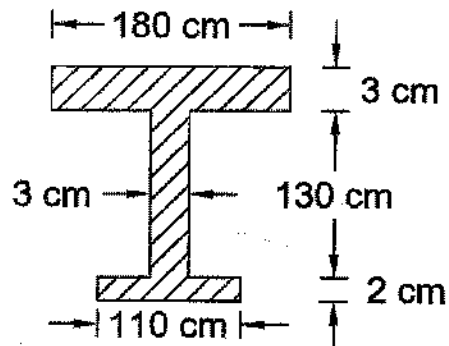


Figure 4



B- Write step by step how to model the shown beam under the given system of reversible loads using program SAP2000 to get maximum and minimum straining actions then, Draw the final solution.

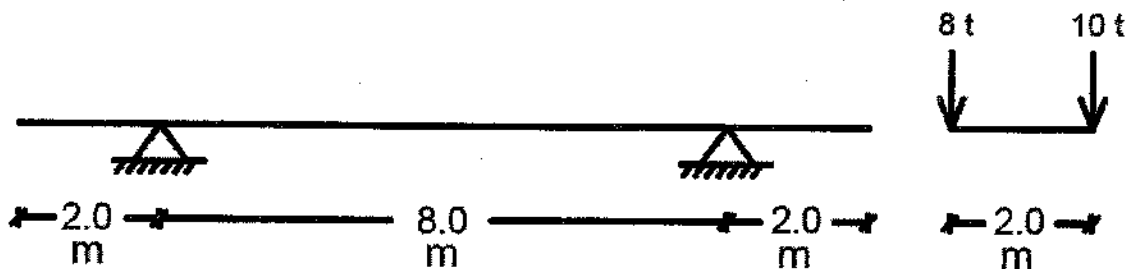


Figure 5

C- What is the meaning of $P-\delta$ (Second order effect) effect, swayed and non-swayed frames, reversible loads, non-reversible loads, buckling failure?

D- In program of SAP2000. How to rotate the local axis for joint, make a spring support, show all straining actions?

With my best wishes
DR. Galal elsamak