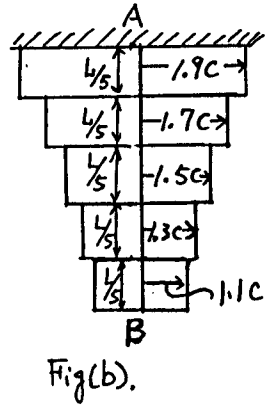
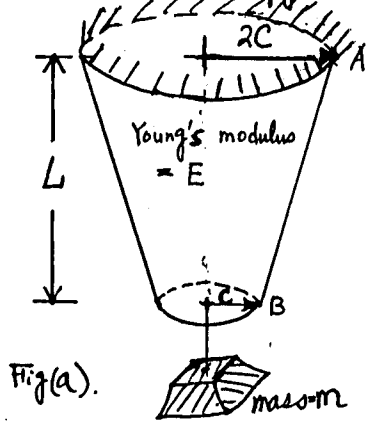


1. (a) Find the strain energy of the solid tapered rod AB.
 (b) If the solid tapered rod is approximated by a stepped rod as shown, then what is the percentage error in the strain energy obtained against the exact solution found in (a)?

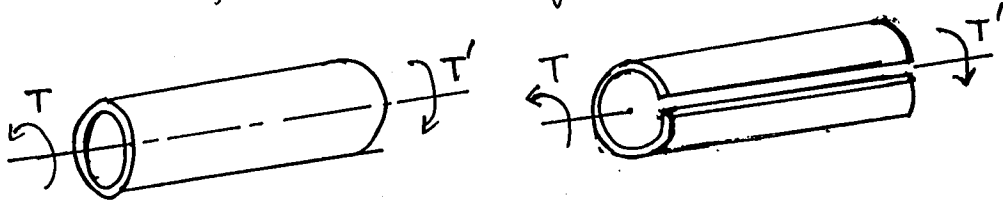
(neglect the effect due to the weight of the rod)

(a): 10 pt.

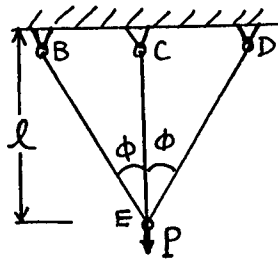
(b): 10 pt.



2. Equal torques are applied to thin-walled tubes of the same thickness t and the same radius C . One of the tubes has been slit lengthwise as shown. Determine the ratio of the maximum shearing stresses in the tubes. (10 pt.)

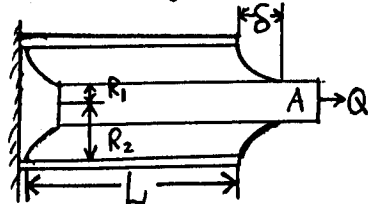
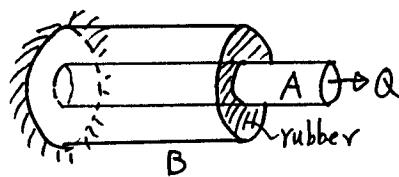


3. Three members of the same material and same cross-sectional area are used to support the load P . Determine the force in each member by using the Castigliano's theorem. (15 pt.)



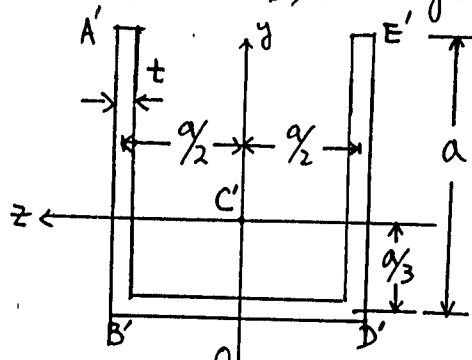
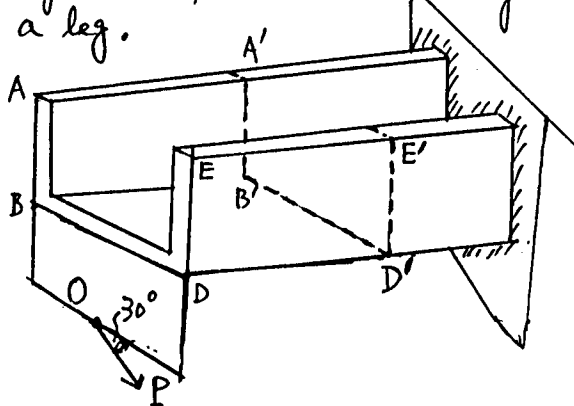
4. A vibration isolation support is made by bounding a rod A, of radius R_1 and a tube B, of inside radius R_2 , to a hollow rubber cylinder. If the rubber has a modulus of rigidity G , then find the relationship between the deflection S of rod A and the vibration force Q in terms of the material property G and the device geometric factor L, R_1 and R_2 .

(10 pt.)



(甲)

5. The cantilever beam shown consists of a channel of uniform thickness. Knowing that the load P acts at the shear center O and in the plane of the end section of the beam, determine the point where the shearing stress is maximum and the corresponding value of the stress (a) along line $B'D'$ in the web, (b) along line $D'E'$ in a leg.



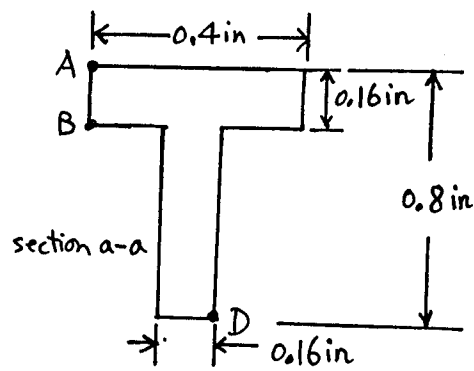
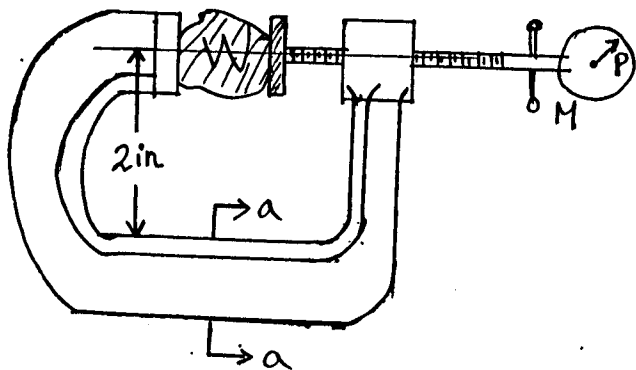
$$I_y = \frac{7}{12} ta^3$$

$$I_z = \frac{1}{3} ta^3$$

(a) 10 pt.

(b) 10 pt.

6. A clamp is used to tighten an object W as shown. The reaction force P due to clamping can be read from the device M . The value of P is 75 lb. Determine (a) the stress at point A , (b) the stress at point D , (c) the location of the neutral axis.



(a) 10 pt

(b) 10 pt

(c) 5 pt