

系所組別： 工程科學系丙、戊、己組

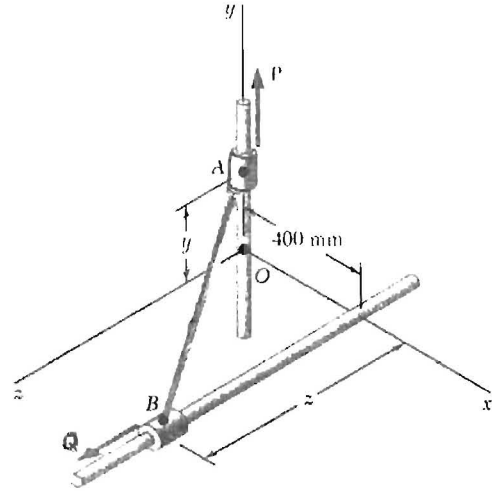
考試科目： 工程力學

考試日期： 0219，節次： 1

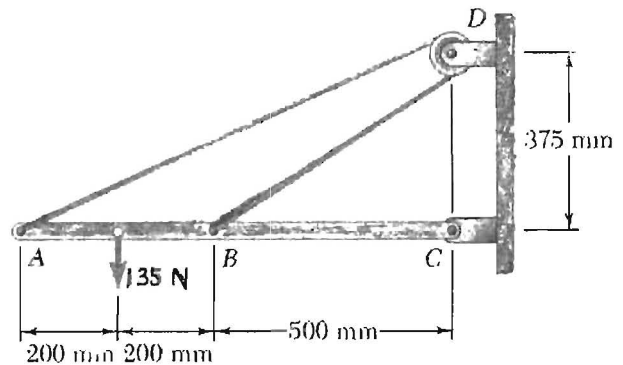
※ 考生請注意：本試題  可  不可 使用計算機

注意：本試卷共10題，每題只有一個答案。批改人員將只核對每題的最後答案（含單位），計算過程只作為確認答案來源（以防作弊）而不予記分。請考生將每題的最後答案（含單位）以方框標註出來，以利批改作業。數值答案若偏離標準答案，將依偏離程度酌情評分。

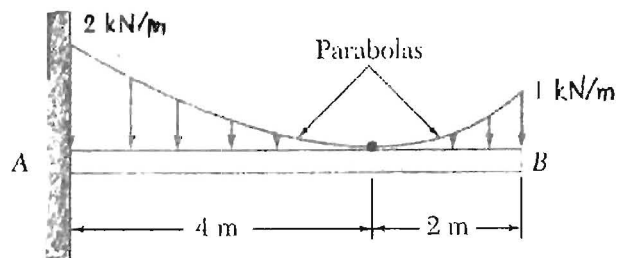
1. (10%) Collars  $A$  and  $B$  are connected by a 1-m-long wire and can slide freely on frictionless rods. If a force  $\bar{P} = 680\text{ N}$  (upward) is applied at  $A$  as shown and knowing  $y = 300\text{ mm}$ , determine the magnitude of the force  $\bar{Q}$  required to maintain the equilibrium of the system.



2. (10%) Neglecting friction and the radius of the pulley, determine the tension  $T$  in cable  $ADB$ .



3. (10%) Determine the magnitude of the moment reaction at the beam support (i.e.,  $M_A$ ) for the given loading.



(背面仍有題目,請繼續作答)

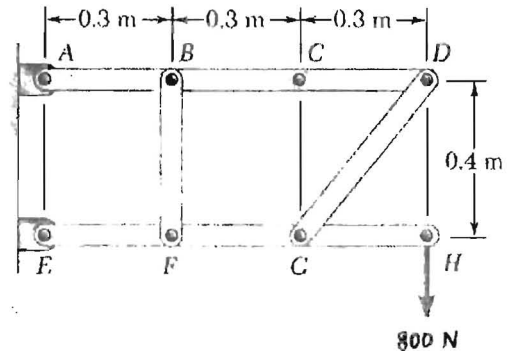
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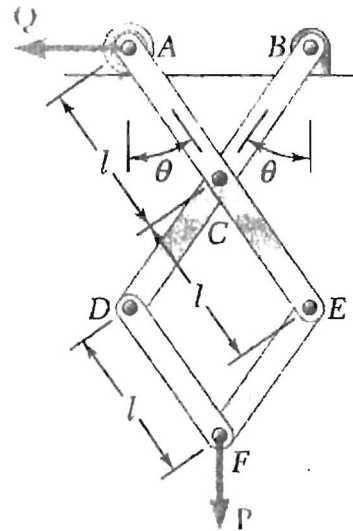
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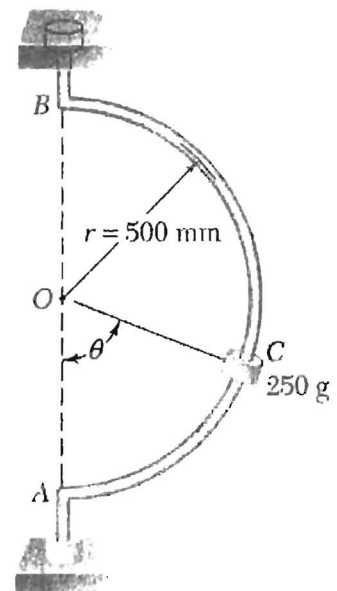
4. (10%) The frame shown consists of members  $ABCD$  and  $EFGH$  and two links that connect the two members. Determine the magnitude of the force in member  $BF$ .



5. (10%) The mechanism shown is acted upon by the force  $\vec{P}$ . Derive an expression for the magnitude of the force  $\vec{Q}$  required for equilibrium (expressed in terms of  $P$  and  $\theta$ ).



6. (10%) A small 250-g collar  $C$  can slide on a semicircular rod which is made to rotate about the vertical  $AB$  at a constant rate of 7.5 rad/s. Determine the value of  $\theta$  ( $0 < \theta < 180^\circ$ ) for which the collar will not slide on the rod, assuming no friction between the collar and the rod.



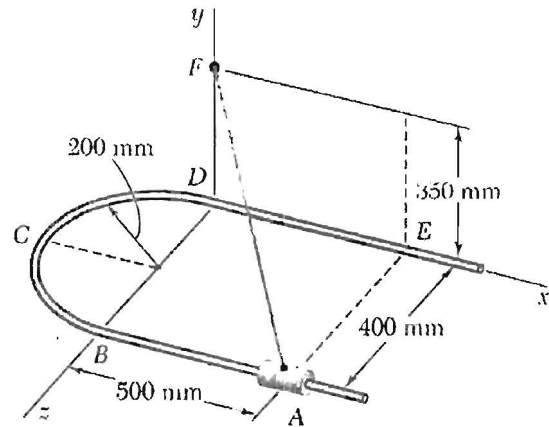
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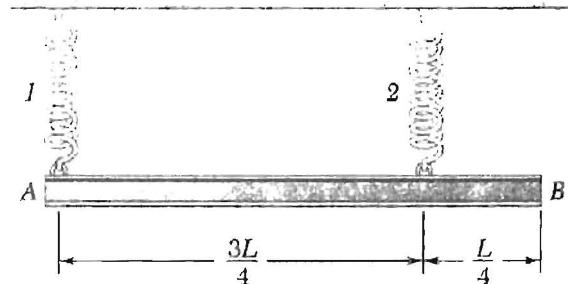
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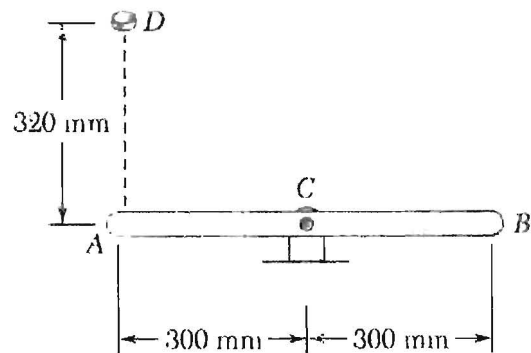
7. (10%) A 750-g collar can slide along the horizontal rod shown. It is attached to an elastic cord with an undeformed length of 300 mm and a spring constant of 150 N/m. Knowing that the collar is released from rest at A and neglecting friction, determine the speed of the collar at E.



8. (10%) A beam AB of mass  $m$  and of uniform cross section is suspended from two springs as shown. If spring 2 breaks, determine at that instant the acceleration of point B (expressed with the gravitational acceleration  $g$ ).



9. (10%) A 15-g magnet D is released from rest in the position shown, falls a distance of 320 mm, and becomes attached at A to the 200-g steel bar AB. Assuming that the impact is perfectly plastic, determine the angular velocity  $\omega$  of the bar AB.



10. (10%) A cylinder of weight  $W$  and radius  $r$  is suspended from a looped cord as shown. One end of the cord is attached directly to a rigid support, while the other end is attached to a spring of constant  $k$ . Determine the natural period  $\tau_n$  of the vibrations of the cylinder.

