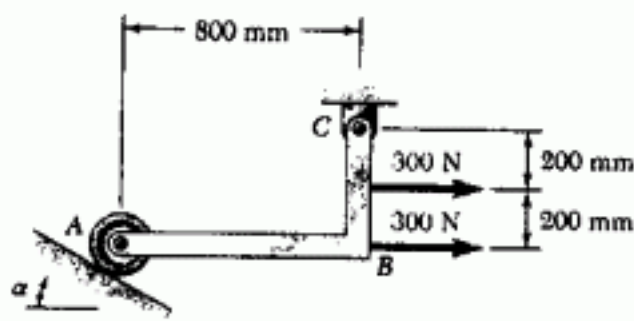


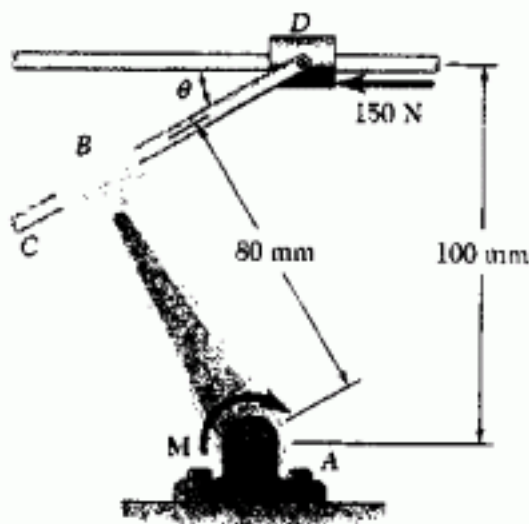
九十一學年度 動力機械 系(所) 丙.丁 組碩士班研究生招生考試

科目 應用力學 科號 1502 共 3 頁第 1 頁 \*請在試卷【答案卷】內作答

1. The bracket ABC supports the two loads shown.
- Determine the reactions at A and C when  $\alpha = 0^\circ$ . (15%)
  - As  $\alpha$  increases, at what angle the bracket becomes improperly constrained? (5%)



2. Rod CD is attached to the collar D and passes through a collar welded to end B of lever AB as shown. Neglecting the effect of friction,
- Draw the free body diagram of lever AB. (10%)
  - Determine the couple M required to hold the system in equilibrium when  $\theta = 60^\circ$ . (10%)



九十一學年度 動力機械 系(所) 機工 組碩士班研究生招生考試

科目 應用力學 科號 1502 共 3 頁第 2 頁 \*請在試卷【答案卷】內作答

3. A ball C, having a mass of 0.5 kg, moves along a grooved horizontal path shown in Fig. 3. The path is in the form of a spiral, which is defined by the equation  $r = (0.1 \theta)$  meter, where  $\theta$  is measured in radians. If the arm OA is rotating at a constant rate of  $d\theta/dt = 4 \text{ rad/sec}$  in the horizontal plane, determine the force it exerts on the ball at the instant  $\theta = \pi \text{ rad}$ . Neglect friction and the size of the ball. (hint: As shown in Fig. 3a, the angle  $\psi$  between the extended radial line OP and the tangent to the curve is:  $\tan \psi = r/(dr/d\theta)$ ) (18%)

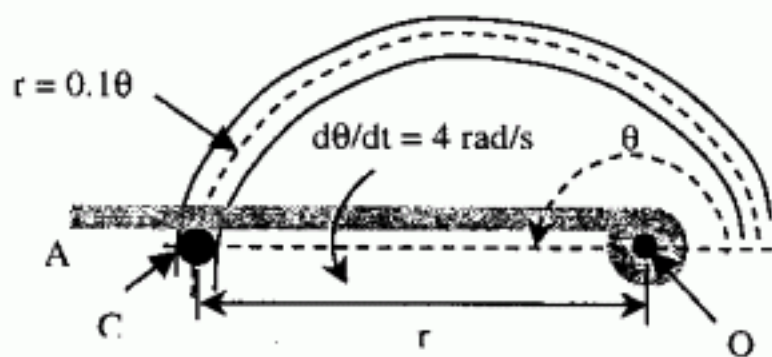


Fig. 3

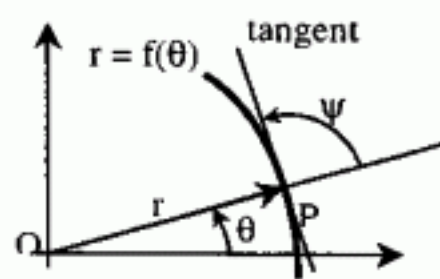


Fig. 3a

4. As shown in Fig. 4, when the 4 kg wooden block is at rest,  $\theta = 0^\circ$ , a 2-g bullet strikes and becomes embedded in it. If it is observed that the block swings upward to a maximum angle of  $\theta = 6^\circ$ , estimate the initial speed of the bullet. (12%)

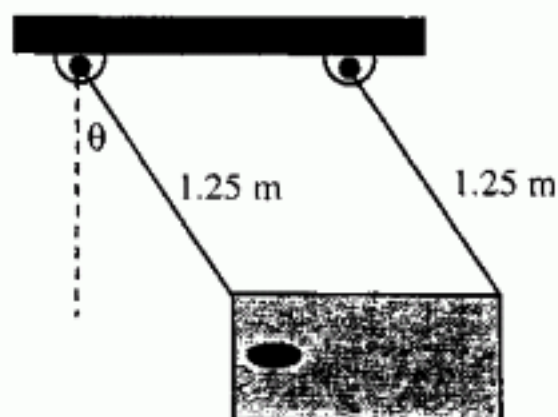
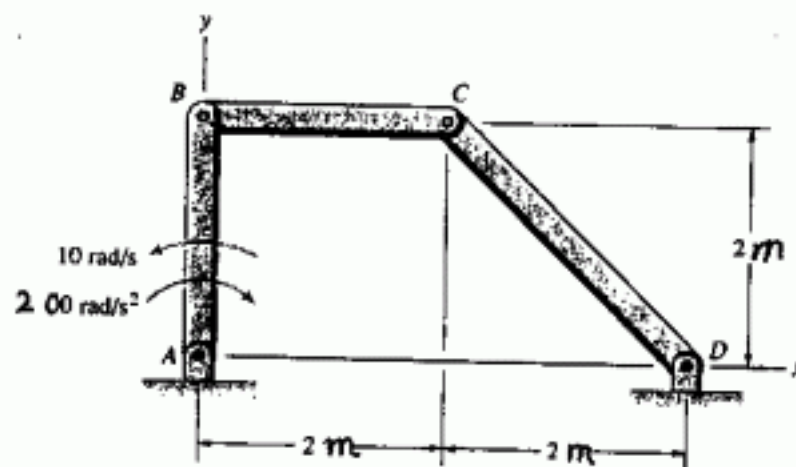


Fig. 4

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5. Bar AB in the Fig. has a counterclockwise angular velocity of  $10 \text{ rad/s}$  and a clockwise angular acceleration of  $200 \text{ rad/s}^2$ . What are the angular accelerations of bars BC and CD in the position shown? (15%)



6. The slender bar AB of length  $L$  forms an angle  $\beta$  with the vertical as it strikes the frictionless surface shown with a vertical velocity  $V$  and no angular velocity. Assuming that the impact (a) is perfectly elastic, (b) is perfectly plastic, find the angular velocity of the bar immediately after the impact respectively for each case. (15%)

