

國立中央大學 105 學年度碩士班考試入學試題

所別： 機械工程學系 碩士班 固力與設計組(一般生)

共 / 頁 第 / 頁

科目： 動力學

本科考試可使用計算器，廠牌、功能不拘

\*請在答案卷(卡)內作答

- (1) As shown in Fig. 1, determine the tension  $P$  in the cable which will give the 45 kg block a steady acceleration of  $1.5 \text{ m/s}^2$  up the incline. (25%)
- (2) An external force  $F = F_0 \sin \omega t$  is applied to the cylinder as shown in Fig. 2.
  - (a) Derive the equation of motion for unknown displacement  $x(t)$  by using Newton's 2<sup>nd</sup> law. Must draw free body diagram. (15%)
  - (b) What is the undamped natural frequency? (4%)
  - (c) Is the steady-state solution an oscillation with a decaying amplitude for nonzero damping  $c$ . Must explain the reason for your answer. (6%)
- (3) The stream of water (density =  $1000 \text{ kg/m}^3$ ), as shown in Fig. 3, flows at a rate of 550 liters/min and moves with a velocity of magnitude 18 m/s at both A and B. The vane is supported by a pin and bracket at C and by a load cell at D which can exert only a horizontal force. Neglecting the weight of the vane, determine the components of the reactions at C and D. Note that  $1 \text{ m}^3 = 1000 \text{ liter}$ . (25%)
- (4) As shown in Fig. 4, a uniform slender rod AB of mass  $m$  is released from rest when  $\theta = 65^\circ$ . Assume that the friction force between end A and the surface is large enough to prevent sliding. Please determine: (a) the angular acceleration of the rod just after release. (10%); (b) the friction force at A. (8%); and (c) the normal reaction at A. (7%)

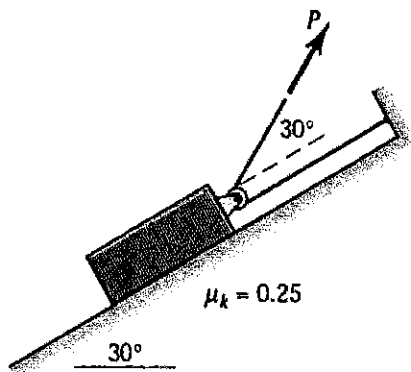


Fig. 1

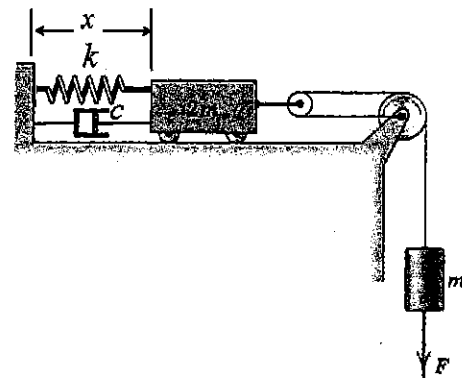


Fig. 2

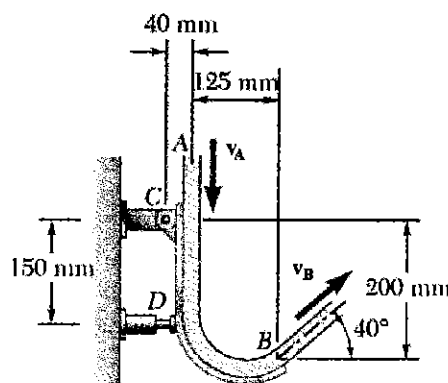


Fig. 3

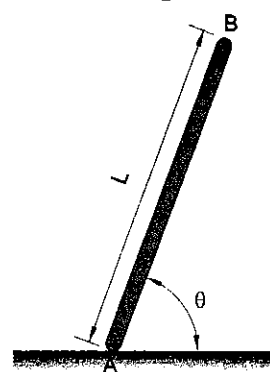


Fig. 4