

國立中央大學 107 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)

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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) The 10-kg slider A moves with negligible friction up the inclined guide, as shown in Fig. 1. The attached spring has a stiffness of 60 N/m and is stretched δ m at position A, where the slider is released from rest. The 250-N force is constant and the pulley offers negligible resistance to the motion of the cord. Calculate the velocity of the slider as it passes C when the initial spring stretch $\delta = 0.3$ m. (25%)
- (2) The 1 meter long rod of mass 15 kg is released with no velocity from the position shown in Fig. 2. Assume that there is no friction and the rod can move freely along the two straight tracks. Please determine: (a) the angular acceleration of the rod (15%), (b) the reactions at A and B (10%).
- (3) A 12-kg block B starts from rest and slides down the inclined surface of a 20-kg wedge A, which is supported by a horizontal surface, as shown in Fig. 3. Neglecting friction, determine
 - (a) the velocity of B relative to A after it has slid 0.6 m down the surface of the wedge. (13%)
 - (b) the corresponding velocity of the wedge. (12%)
- (4) (a) Find the natural frequency of the system with two springs connected to the rigid beam (Fig. 4a) where end P is a pin. (13%)
 - (b) If considering an elastic, cantilever beam in Fig. 4b with fixed point at P, determine the natural frequency. Elastic beam means that you need to consider the beam as an equivalent spring. (12%)

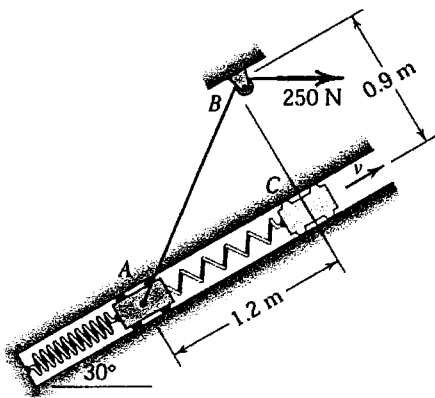


Fig. 1

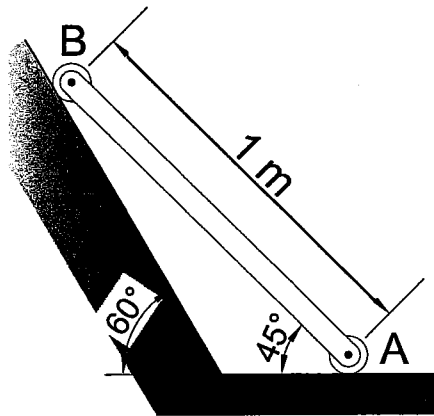


Fig. 2

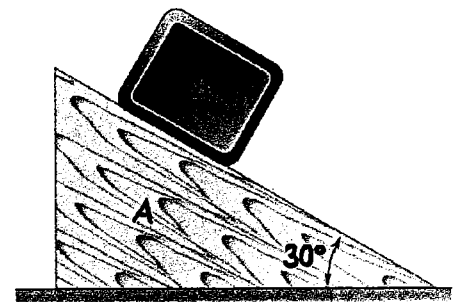


Fig. 3

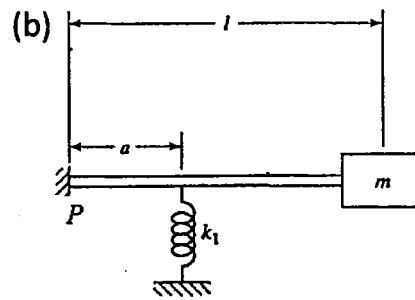
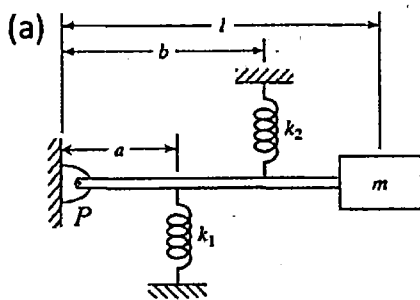


Fig. 4

Hint for (b)

equivalent spring:
cantilever beam with end load

$$\begin{array}{c}
 \text{Diagram of cantilever beam with end load } F \text{ at length } l \\
 k_{eq} = \frac{3EI}{l^3}
 \end{array}$$

$$\text{deflection: } y_{\max} = \frac{Fl^3}{3EI}$$

參考用