

國立中央大學 106 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 2 頁 第 1 頁

科目： 動力學

本科考試可使用計算器，廠牌、功能不拘 須有計算過程

*請在答案卷 內作答

1. As shown in the Fig. 1, a slider A with mass, $m = 2.0$ kg, is pulled by a rope and moved along a vertical rod. The rope is wrapped tightly on a pulley B with a horizontal distance, $l = 2.0$ m, apart away from the rod and rolled by a drum wheel with a linear velocity $v_0 = 1.0$ m/s. If the size of pulley is ignored, please computing the tension force T acting on the rope while the slider is at $x = 0.3$ m. (25%)

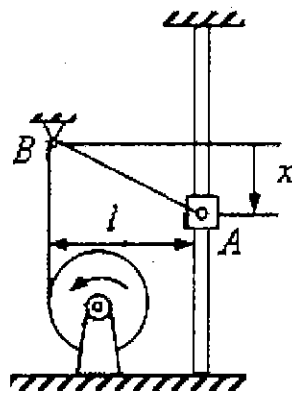


Fig. 1

參考用

2. Mass C with a mass of 4 kg is suspended from a cord attached to cart A , which has a mass of 5 kg and can roll freely on a frictionless horizontal track. A 60-g bullet is fired with a speed $V_0 = 500$ m/s, as shown in the Fig. 2, and gets lodged in block C . Determine:
- the velocity of C as it reaches its maximum elevation, (12%)
 - the maximum vertical distance h through which block C will rise. (13%)

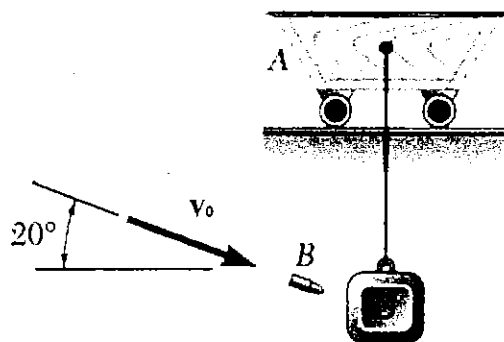


Fig. 2

注意：背面有試題

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3. Figure 3 shows a slider-crank system. The length of the connecting rod BC is 100 mm, and the length of the crank AB is 40 mm. Assume that both rods, AB and BC, are uniform and slender. The frictions on the surfaces of the slider is negligible. The mass of the slider (piston) is 0.8 kg, and the mass of the connecting rod BC is 0.5 kg. The crank AB is rotating with a constant angular velocity of 300 rpm clockwise. When the rotational angle of the crank AB, θ , is 180° , please determine:
- The angular velocity ω_{BC} of the connecting rod BC? (6%)
 - The acceleration of the slider (point C)? (6%)
 - The force exerted on the connecting rod BC at point C? (Neglect the effect of the weight of the rod) (5%)
 - The force exerted on the connecting rod BC at point B? (Neglect the effect of the weight of the rod) (8%)

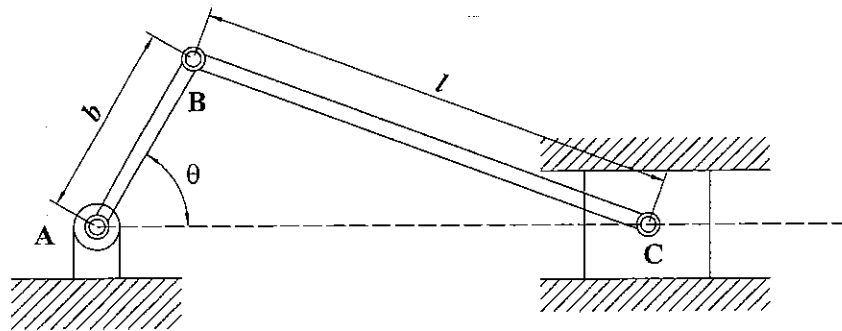


Fig. 3

4. As shown in Fig. 4, the light rod and the attached sphere of mass m are at rest in the horizontal position shown. (a) Draw free body diagram of the system. (b) Use a method similar to Newton's 2nd law to derive the equations of motion. (c) Determine the period T for small oscillations about the pivot O . Neglect gravity. (25%)

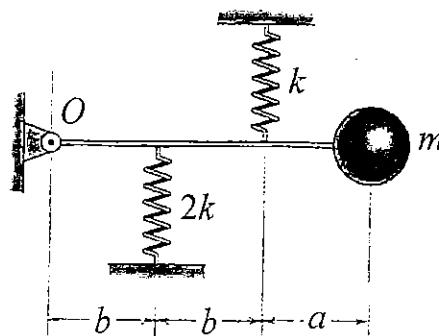


Fig. 4