

國立彰化師範大學105學年度碩士班招生考試試題

系所： 車輛科技研究所(選考丁)、
機電工程學系(選考乙)

科目： 動力學

☆☆請在答案紙上作答☆☆

共 3 頁，第 1 頁

每題 20 分，共 100 分。可以不依順序作答，但應清楚標示題號。

1. The 20-kg disk A is attached to the 10-kg block B using the cable and pulley system shown in Fig. 1. Determine the minimum coefficient of static friction between the disk and the surface so that the disk will roll without slipping when they are released from rest. Neglect the mass of the pulleys.

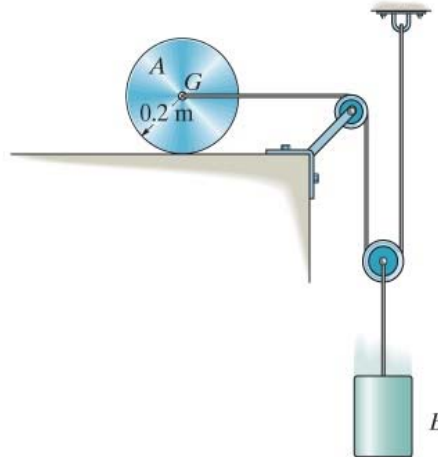


Fig. 1

2. In Fig. 2 the 40 kg pendulum has its mass center at G and a radius of gyration about point G of $k_G = 300$ mm. If released from rest when $\theta = 0^\circ$, determine its angular velocity at the instant $\theta = 90^\circ$. Spring AB has a stiffness of $k = 300$ N/m and is unstretched when $\theta = 0^\circ$.

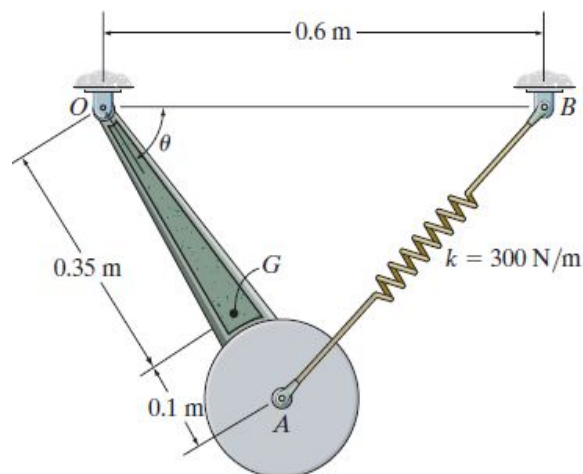


Fig. 2

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3. The 0.5 kg ball B is attached to a cord which passes through a hole at A in a smooth table, as Fig. 3 shows. When the ball is $r_1 = 0.5$ m from the hole, it is rotating around in a circle such that its speed is $v_1 = 1.2$ m/s. By applying a force \mathbf{F} the cord is pulled downward through the hole with a constant speed $v_c = 3$ m/s. Determine (a) the speed of the ball at the instant it is $r_2 = 0.3$ m from the hole, and (b) the amount of work done by \mathbf{F} in shortening the radial distance from r_1 to r_2 .

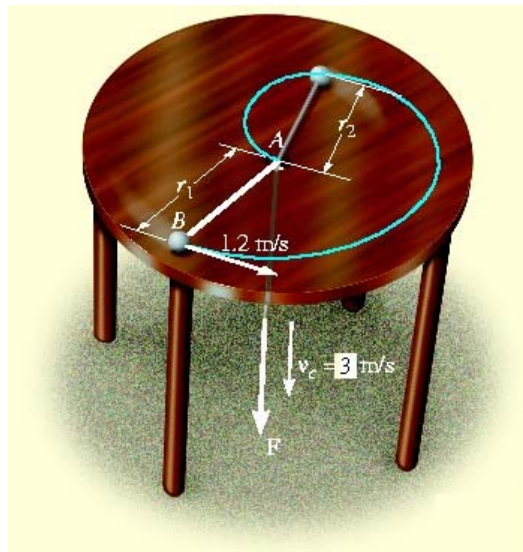


Fig. 3

4. In Fig. 4, ball C moves with a speed of 3 m/s which is increasing at a constant rate of 1.5 m/s^2 , both measured relative to the circular plate and directed as shown. At the same instant the plate rotates with the angular velocity and angular acceleration shown. Determine the velocity and acceleration of the ball at the instant.

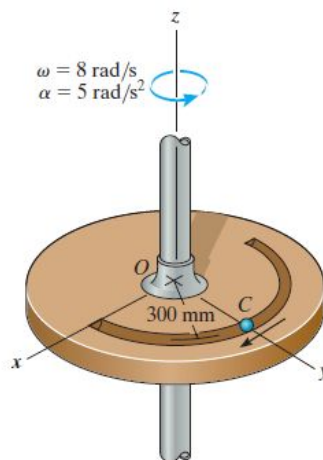


Fig. 4

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5. As shown in Fig. 5, the torsional spring has a stiffness of $30 \text{ N}\cdot\text{m}/\text{rad}$ and is undeflected when the 6-kg uniform slender bar is in the upright position. If the bar is released from rest in the horizontal position shown, determine the angular velocity ω as it passes the vertical position. Neglect friction.

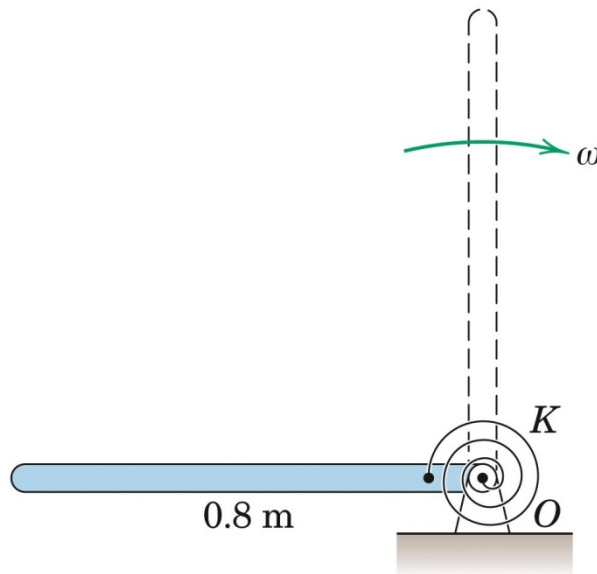


Fig. 5