銘傳大學 96 學年度研究所碩士班招生考試

管理研究所碩士班（甲組）

第一節

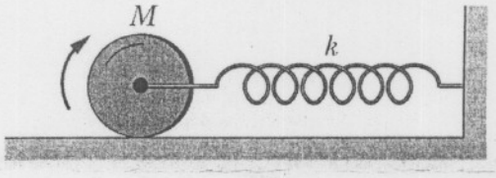
普通物理學試題

（限用答案本作答）

可以使用計算機

1. A banded circular highway curve is designed for traffic moving at 60 km/hr. The radius of the curve is 200 m. Traffic is moving the highway at 40 km/hr on a rainy day. What is the minimum coefficient of friction between tires and road that will allow cars to take the turn without sliding off the road? (20%)

2. In the figure, a solid cylinder is attached to a horizontal spring so that it can roll without slipping along a horizontal surface. The spring constant k is 3.0 N/m. If the system is released from rest at a position in which the spring is stretched by 0.25 m, find (a) the translational kinetic energy and (b) the rotational kinetic energy of the cylinder as it passes through equilibrium position. (c) Show that under these conditions the center of mass of the cylinder executes simple harmonic motion with period

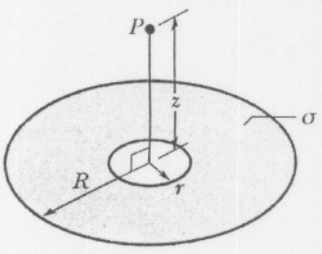


$$T = 2\pi\sqrt{\frac{3M}{2k}}$$

where M is the mass of the cylinder. (20%)

3. A 20 kg object is acted on by a conservative force given by $F = -3.0x - 5.0x^2$, with F in newtons and x in meters. Take the potential energy associated with the force to be zero when the object is at x=0. (a) What is the potential energy of the system associated with the force when the object is at x=2.0 m ? (b) If the object has a velocity of 4.0 m/sec in the negative direction of the x-axis when it is at x=5.0 m, what is its speed when it passes through the origin? (20%)

4. Figure show a ring of outer radius R and inner radius r=0.2R; the ring has a uniform surface charge density σ. With V=0 at infinity, find an expression for the electric potential at point P on the central axis of the ring, at a distance z=2.0R from the center of the ring. (20%)



5. A violin string, oscillating in its fundamental mode, generates a sound wave with wavelength λ. By what multiple must the tension be increased if the string, still oscillating in its fundamental mode, is to generate a sound wave with wavelength λ/2? (20%)

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