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編號: 155 系所: 工程科學系丙組 成組, 己組 科目: 工程力學

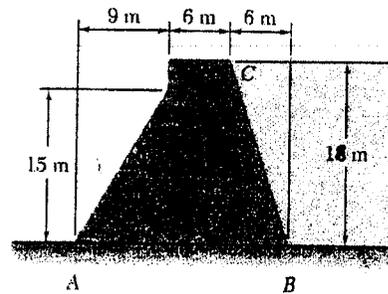
本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

依試題內之格式寫入答案卷內

注意: 本試卷全部為填充題, 請將答案直接填入本試卷內之空格內, 否則不予計分。共 10 題, 每題 10 分。

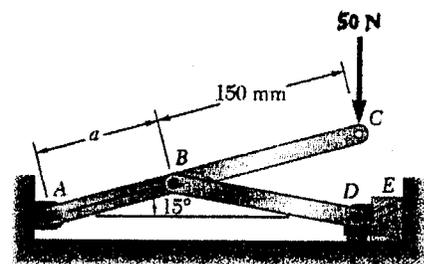
1. The cross section of a concrete dam is as shown. Use 1000 kg/m^3 for the density of the water on the right side of the dam and 2400 kg/m^3 for the density of concrete. Determine the point of application of the resultant of the reaction forces exerted by the ground on the base AB .

Answer: _____ m, to the right of A .



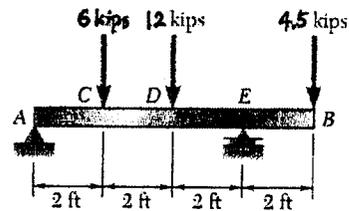
2. A 50-N force directed vertically downward is applied to the toggle vise at C . Knowing that link BD is 150 mm long and that $a = 100 \text{ mm}$, determine the magnitude of the horizontal force exerted on block E . (Note: C and D are not vertically aligned.)

Answer: _____ N.



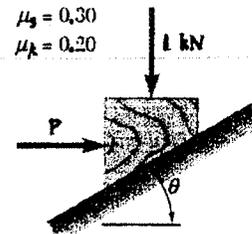
3. For the beam and loading shown, determine (a) the maximum absolute values of the shear and (b) the maximum absolute values of the bending moment.

Answer: (a) _____ kips, (b) _____ kips-ft.



4. The block shown is subjected a vertical force 1 kN and a horizontal force $P = 200 \text{ N}$. Assume the coefficients of friction between the block and the incline are $\mu_s = 0.30$ and $\mu_k = 0.20$. When $\theta = 30^\circ$, determine (a) whether the block is in equilibrium or moving, (b) the magnitude of the friction force.

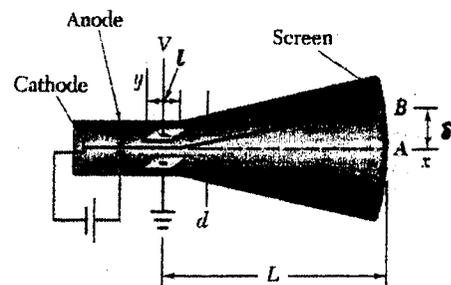
Answer: (a) _____, (b) _____ N.



5. In the cathode-ray tube (CRT) shown, electrons emitted by the cathode and attracted by the anode pass through a small hole in the anode and then travel in a straight line with a speed v_0 until they strike the screen at A . However, if a difference of potential V is established between the two parallel plates, the electrons will be subjected to a force F perpendicular to the plates while they travel between the plates and will strike the screen at point B , which is at a distance δ from A . The magnitude of the force F is $F = eV/d$, where e is the charge of an electron and d is the distance between the plates. Neglecting the effects of gravity and assuming the mass of an electron is m , derive an expression for the deflection δ in terms of V , v_0 , e , m , d , l , and L .

Answer: _____

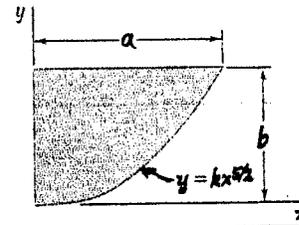
(背面仍有題目, 請繼續作答)



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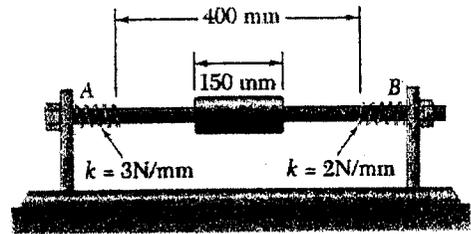
6. Determine the moment of inertia in terms of a and b of the shaded area with respect to the y axis. The area has a curve $y = kx^{5/2}$.

Answer: _____.



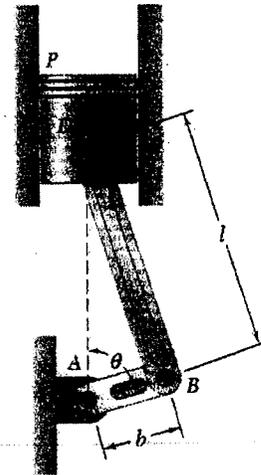
7. A 4-kg collar C slides on a horizontal rod between springs A and B . If the collar is pushed to the right until spring B is compressed 50 mm and released, determine the distance through which the collar will travel (including the amount of compression, 50 mm.), assuming a coefficient of friction $\mu_k = 0.35$ between the collar and the rod.

Answer: _____ mm.



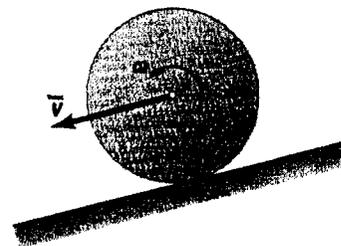
8. In the engine system shown, $l = 8$ in, and $b = 3$ in. Knowing that the crank AB rotates with a constant angular velocity of 1000 rpm clockwise, determine the magnitude of the velocity of piston P when $\theta = 90^\circ$.

Answer: _____ in/s.



9. A sphere with radius r is released from rest on an incline. Determine the magnitude of the angular velocity of the sphere after it has rolled through a distance corresponding to a change in elevation h , assuming a gravitational acceleration g . The answer should be expressed in terms of r , g and h .

Answer: _____.



10. From mechanics of materials it is known that for a simply supported beam of uniform cross section a static load P applied at the center will cause a deflection $\delta_A = PL^3/48EI$, where L is the length of the beam, E is the modulus of elasticity, and I is the moment of inertia of the cross-sectional area of the beam. Knowing that $L = 5$ m, $E = 200$ GPa, and $I = 20$ cm⁴, determine (a) the equivalent spring constant of the beam, (b) the frequency of vibration of a 750 kg block attached to the center of the beam, neglecting the mass of the beam.

Answer: (a) _____ N/m, (b) _____ Hz.

