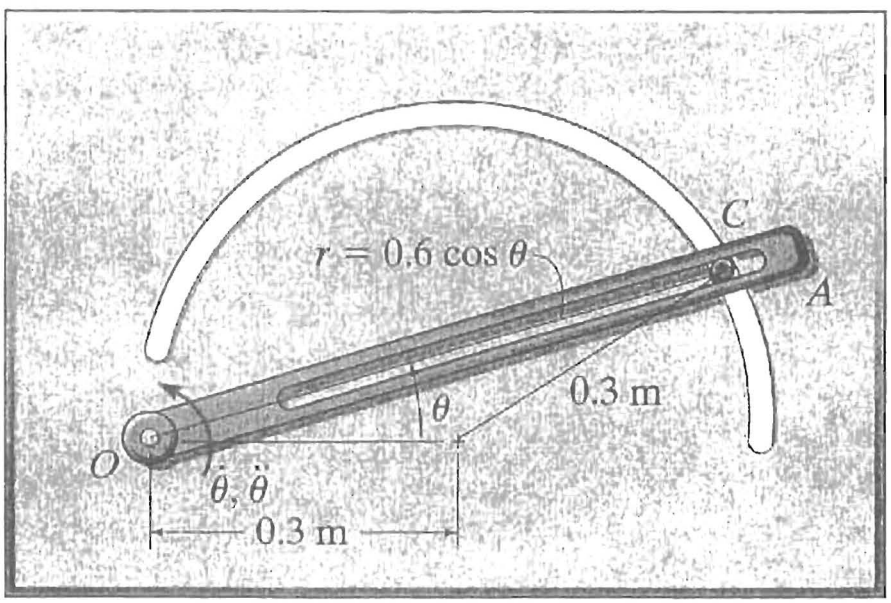
※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

1.
(a) State the Newton's second laws of motion. (5%)
(b) What is the relation among the Newton's second law of motion, the principle of work and energy and the principle of impulse and momentum? (10%)
(c) Which kinds of problem can not be solved by the principle of work and energy? Explain the reason. (5%)

2. The wheels of racing cars will have to depend upon friction to prevent any car from sliding up or down the track with banking angle θ. Without slipping, what are the maximum and the minimum speeds of the cars, if the coefficient of kinetic friction between the wheels and the road is μ_k? Assume the cars have negligible size, a mass m, and travel around the curve of radius ρ with a constant speed v. (20%)

3. Due to the constraint, the 0.5 kg cylinder C travels along the path described by $r = (0.6\cos\theta)$ m. If arm OA rotates counterclockwise with an angular velocity of $\dot{\theta} = 2$ rad/s and an angular acceleration of $\ddot{\theta} = 0.8$ rad/s^2 at the instant $\theta = 30°$, determine the force exerted by the arm on the cylinder at this instant. The cylinder is in contact with only one edge of the smooth slot, and the motion occurs in the *horizontal* plane. (20%)



(背面仍有題目,請繼續作答)

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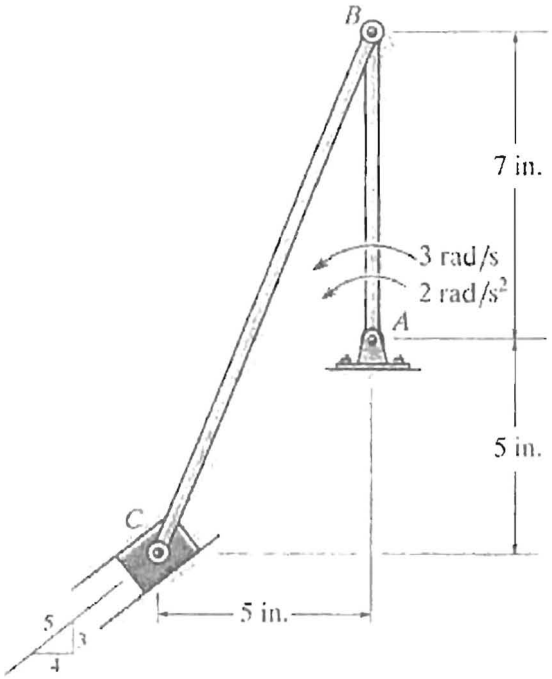
4. At the given instant member AB has the angular motions shown. Determine the velocity and acceleration of the slider block C at this instant. (20%)



5. Determine the angular acceleration of the 25 kg diving board and the reaction at the pin A the instant the man jumps off. Assume that the board is uniform and rigid, and that at the instant he jumps off the spring is compressed a maximum amount of 200 mm, $\omega = 0$, and the board is horizontal. Take $k = 7$ kN/m. (20%)