

國立成功大學

113學年度碩士班招生考試試題

編 號： 70

系 所： 機械工程學系

科 目： 動力學

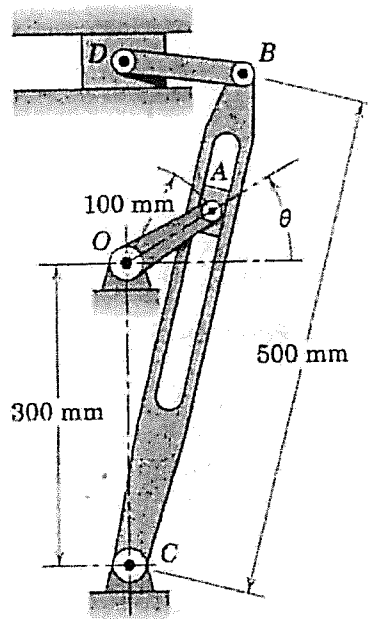
日 期： 0201

節 次： 第 2 節

備 註： 可使用計算機

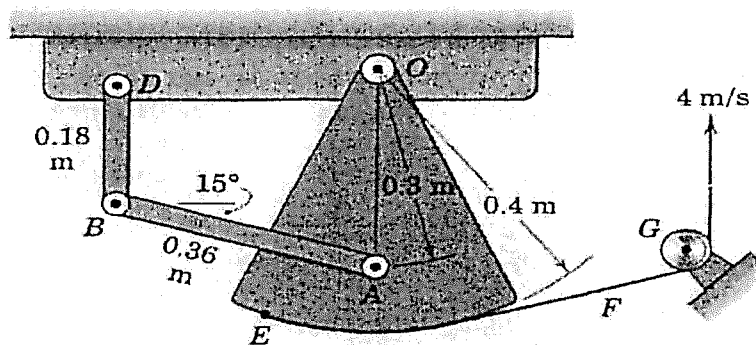
※ 考生請注意: 本試題可使用計算機。 請於答案卷(卡)作答, 於本試題紙上作答者, 不予計分。

1. The figure illustrates a commonly used quick-return mechanism which produces a slow cutting stroke of the tool (attached to D) and a rapid return stroke. If the driving crank OA is turning at the constant rate $\dot{\theta} = 1 \text{ rad/s}$, determine the magnitude of the velocity of point B for the instant when $\theta = 30^\circ$. (20%)



Prob. 1

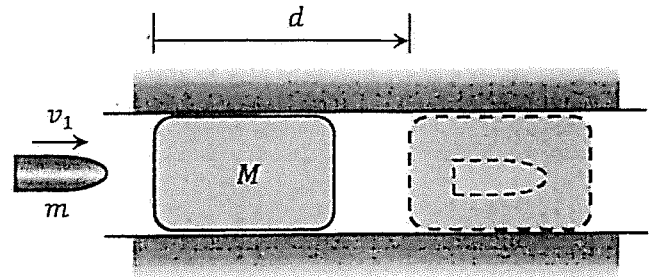
2. The flexible band F is attached at E to the rotating sector and leads over the guide pulley G. Determine the angular velocities of links AB and BD for the position shown if the band has a speed of 4 m/s. (20%)



Prob. 2

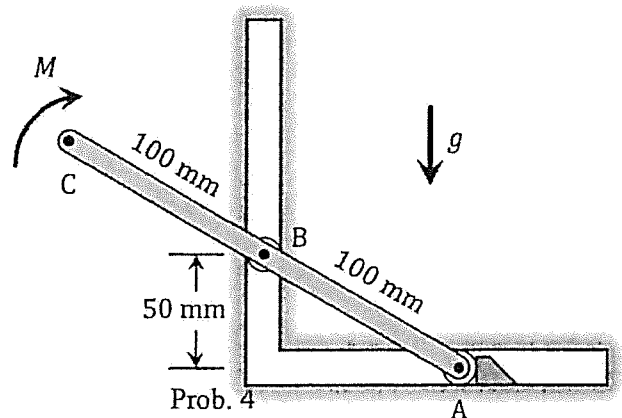
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3. (20%) The bullet with a mass of $m = 100 \text{ g}$ traveling at $v_1 = 810 \text{ m/s}$ strikes and becomes embedded in the block with a mass of $M = 8 \text{ kg}$. The block is initially stationary. After strike, the block slides along the horizontal guide. Calculate the velocity v_2 of the block immediately after the strike. If the kinetic friction coefficient between the block and the guider is $\mu = 0.5$, calculate the sliding distance d of the block from the strike to the time that the block stops.



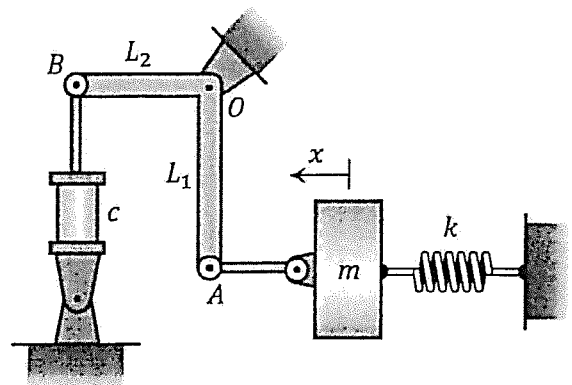
Prob. 3

4. (20%) The uniform 5-kg slender bar ABC is initially at rest with end A bearing against the stop in the horizontal guide. When a constant moment $M = 15 \text{ N-m}$ is applied to end C, the bar rotates causing end A to strike the side of the vertical guide with a velocity of 3.5 m/s . Calculate the energy loss ΔE due to friction between the guides and rollers. The mass of the rollers may be neglected.



Prob. 4

5. (20%) The L-shaped crank AB pivoted at O is connected with the mass, spring and damper, as shown in the figure. Neglect the mass of the crank AB and assume small oscillations about the equilibrium position shown.



Prob. 5

- (1) Derive the equation of motion in terms of the displacement x , mass m , spring constant k , damper c and the two arm lengths L_1 and L_2 .
- (2) Determine the natural frequency (in Hz) and the maximum arm length L_2 of the crank such that the vibration system is under damping if $m = 0.25 \text{ kg}$, $k = 40000 \text{ N/m}$, $c = 50 \text{ N-s/m}$, $L_1 = 100 \text{ mm}$.