

國立臺北科技大學

九十二學年度自動化科技研究所入學考試

工程力學試題

填准考證號碼

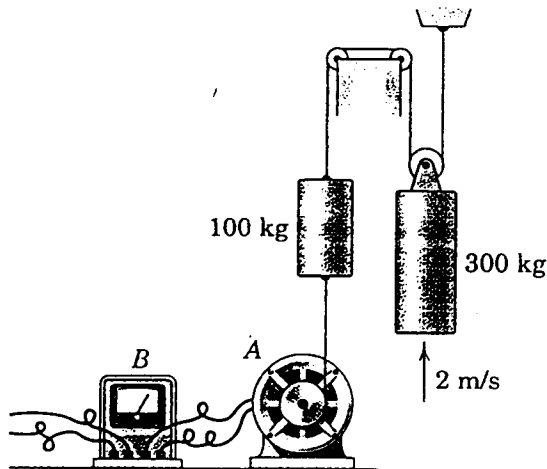
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注意事項：

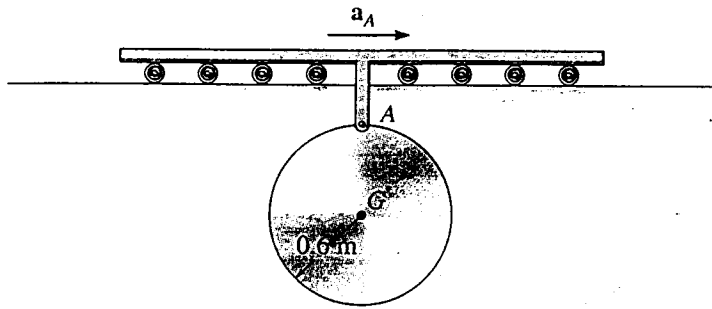
1. 本試題共【五】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. The motor unit A is used to elevate the 300-kg cylinder at a constant rate of 2 m/s. If the power meter B registers an electrical input of 2.20 kW, calculate the combined electrical and mechanical efficiency e of the system. (10 分)



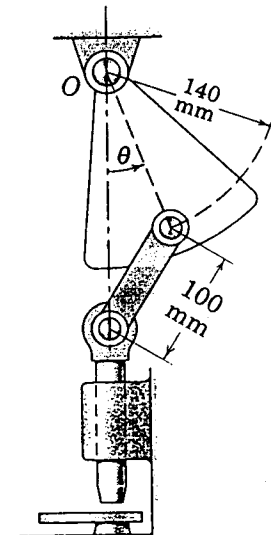
Problem 1

2. The 75-N circular plate is suspended from a pin at A . If the pin is connected to a track which is given an acceleration $a_A = 0.9 \text{ m/s}^2$, determine the horizontal and vertical components of reaction at A and the acceleration of the plate's mass center G . The plate is originally at rest. (20 分)



Problem 2

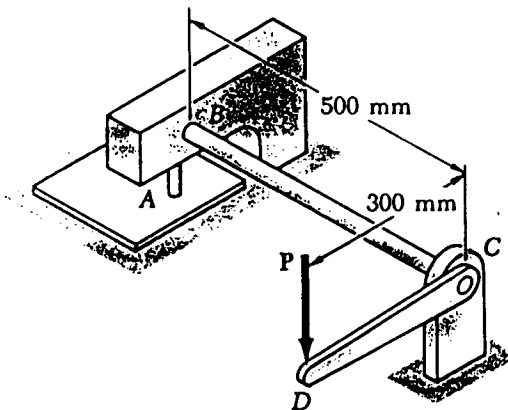
3. The punch is operated by a simple harmonic oscillation of the pivoted sector given by $\theta = \theta_0 \sin 2\pi t$ where the amplitude is $\theta_0 = \pi/12 \text{ rad}$ (or 15°) and the time for one complete oscillation is 1 second. Determine the acceleration of the punch when $\theta = \pi/12$. (20 分)



Problem 3

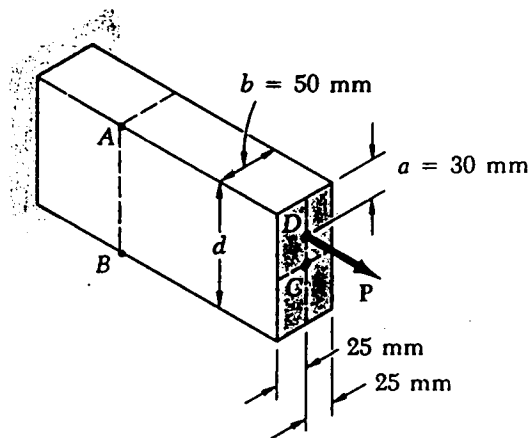
注意：背面尚有試題

4. A hole is punched at A in a plastic sheet by applying a 600-N force P to end D of lever CD , which is rigidly attached to the solid cylindrical shaft BC . Design specifications require that the displacement of D should not exceed 15 mm from the time the punch first touches the plastic sheet to the time it actually penetrates it. Determine the required diameter of shaft BC if the shaft is made of aluminum with shear modulus $G=26$ GPa and allowable shearing stress $\tau_{all} = 70$ MPa. (25 分)



Problem 4

5. The eccentric axial force P acts at point D , which must be located 30 mm below the top surface of the steel bar shown. For $P = 90$ kN, determine (a) the depth d of the bar for which the tensile stress at point A is maximum, (b) the corresponding value of the stress at point A . (25 分)



Problem 5