

國立中央大學104學年度碩士班考試入學試題

所別：機械工程學系碩士班 甲組(固力與設計)(一般生) 科目：動力學 共 / 頁 第 / 頁
 機械工程學系碩士班 丁組(系統)(一般生)
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本科考試可使用計算器，廠牌、功能不拘

*請在答案卷(卡)內作答

- (1) As shown in Fig. 1, slider block B moves to the right with a constant velocity of 300 mm/s. Determine
 - (a) the velocity of slider block A, (12%)
 - (b) the velocity of portion D of the cable. (13%)

- (2) Consider the vibration system shown in Fig. 2.
 - (a) Draw the free body diagram of the mass. According to the diagram, derive the equation of motion of the system. (6%)
 - (b) For $m = 2\text{ kg}$, $k = 5000\text{ N/m}$, what are the values of damping ratio and damping coefficient c for the system being critically damped? (6%)
 - (c) What is the undamped natural frequency? (3%)
 - (d) Derive the general form of the time response if the system is an underdamped system. (No need to give numbers.) Also, sketch the response. (10%)

- (3) As shown in Fig. 3, the end of a chain of length L and mass ρ per unit length, which is piled on a platform, is lifted vertically with a constant velocity v by a variable force P . (gravitational acceleration = g)
 - (a) Please determine P as a function of the height x of the end above the platform. (13%)
 - (b) Please determine the energy lost during the lifting of the chain. (12%)

- (4) As shown in Fig. 4, the planet wheel A is driven by a fixed torque M with an angular velocity ω_A and contacts with a fixed ring wheel B at an instantaneous point of tangency P. If the planet wheel A has a mass of m_1 and a radius of R , and the crank has a mass of m_2 and a length of l . This system is horizontally set. Please derive the equation of angular displacement ϕ using the work-energy theorem from the rest to the motion state through a period of time t . (The initial angular displacement is ϕ_0) (25%)

<Hint>

Moment of inertia J of a thin plate with a mass of m and a radius of r : $J = \frac{1}{2}mr^2$

Moment of inertia J of a rod with a mass of m and a length of L : $J = \frac{1}{3}mL^2$

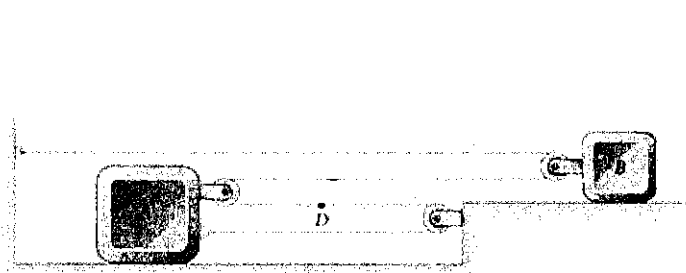


Fig. 1

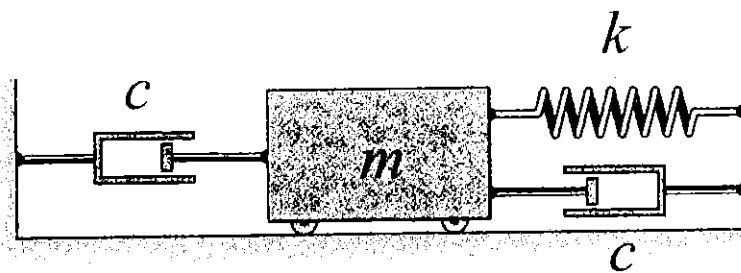


Fig. 2

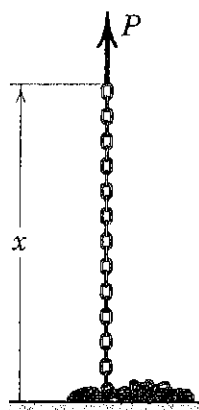


Fig. 3

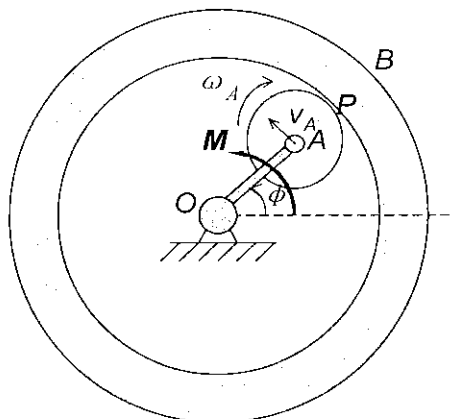


Fig. 4

參考用