所別：機械工程學系碩士班 甲組(固力與設計) 科目：動力學
丁組(系統)

1.

(1) **(選擇題 8 %)** 如 **Fig. 1** 所示，一物塊質量 5 kg，在離牆 6 m 處以 $v_1 = 14$ m/s 的速度向牆衝去，假設物塊與地面之動摩擦係數為 $\mu_k = 0.3$，碰撞後物塊靜止，牆對物塊作用之衝量為(A)70 (B)63.4 (C)56.8 (D)52.4 N · s

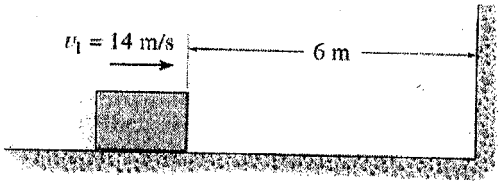

Fig. 1

(2) **(8 %)** In **Fig. 2**, the collar of the mass m slides up the vertical shaft under the action of a force F. The coefficient of kinetic friction between the collar and the shaft is μ_k. Draw the free-body diagram of the collar.

(3) **(9 %)** Determine the speed of block A in **Fig. 3**. Block B has an upward speed of 6 ft/s.

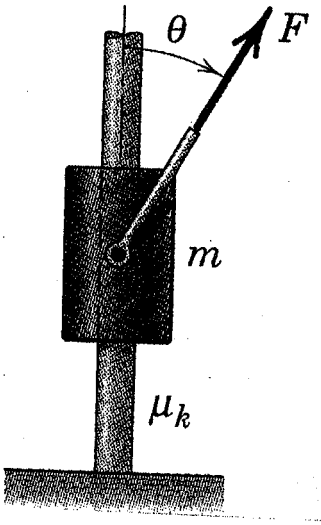

Fig. 2

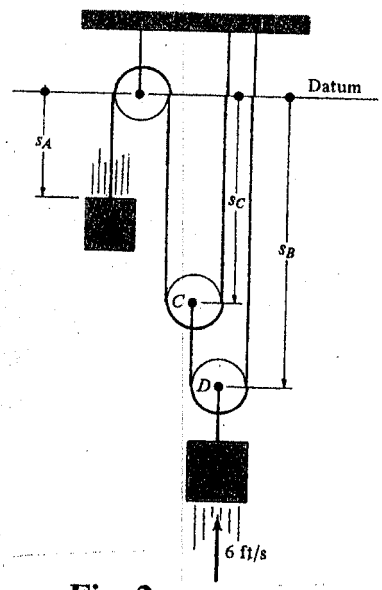

Fig. 3

2. **(25 %)** In **Fig. 4**, the uniform slender rod AB weighing w, is welded to the hub D, and the system rotates about the vertical axis DE with a constant angular velocity ω. Denoting by ρ the mass per unit length of the rod, express the tension in the rod at a distance z from end A in terms of w, l, z, and ω.

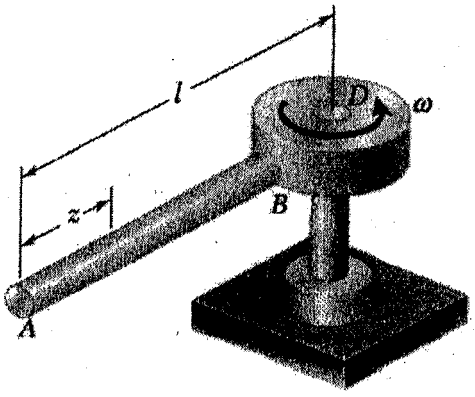

Fig. 4

注意：背面有試題

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3. **(25 %)** In **Fig. 5**, the motor ***M*** is used via the gear arrangement to lift block ***E***. If the motor shaft is turning gear ***A*** at a constant rate ω_A=4 *rad/s*, determine the velocity of ***E***.

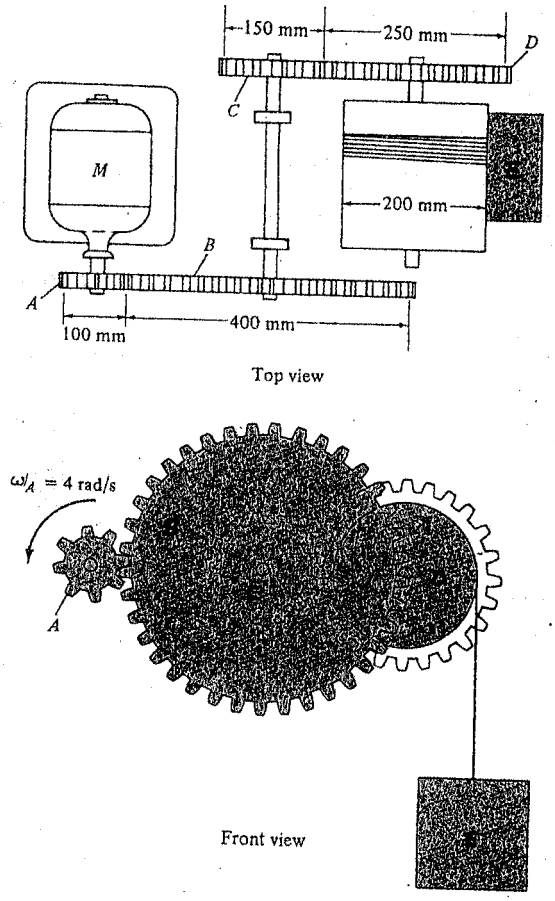

Fig. 5

4. **(25 %)** Calculate the damping ratio of the system shown in **Fig. 6** if the mass and radius of gyration of the stepped cylinder are m = 8 kg and R = 135 mm, the spring constant is k =2.6 kN/m, and the damping coefficient of the hydraulic cylinder is c = 30 N · s/m. The stepped cylinder rolls without slipping on the radius r = 150 mm and the spring can support tension as well as compression.

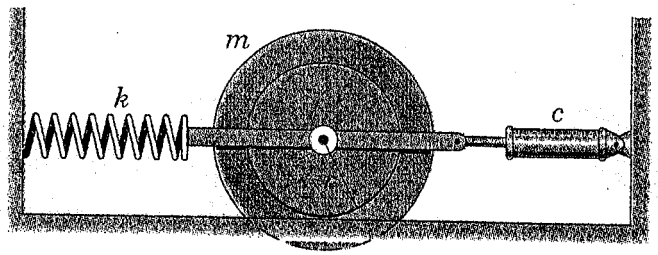

Fig. 6