國立成功大學

114學年度碩士班招生考試試題

編　號：100

系　所：系統及船舶機電工程學系

科　目：動力學

日　期：0210

節　次：第 2 節

注　意：1.可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

請注意，所有問題請以數字作答。重力加速度 $g = 9.81$ m/s^2(方向朝下)，圓周率 $\pi = 3.14$ rad。共五題。

(1) The 12-kg wheel shown in **Fig. 1** has a moment of inertia $I_G = 0.15$ kg·m^2. Assuming that the wheel does not slip or rebound, determine the minimum velocity v_G it must have to just roll over the obstruction at *A*. [20%]

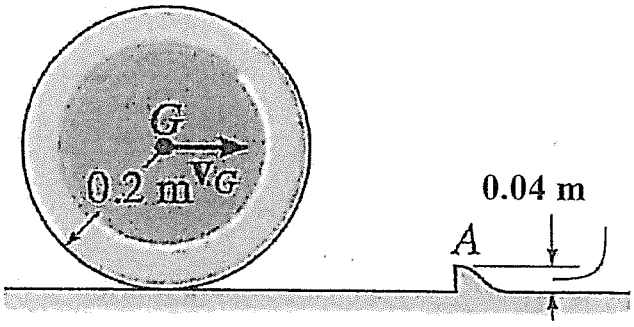

Fig. 1

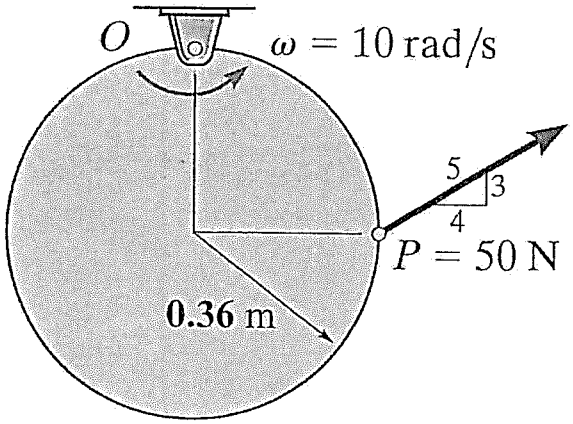

Fig. 2

(2) **See Fig. 2.** At the instant shown, the 30-kg disk has a counterclockwise angular velocity of $\omega = 10$ rad/s. Determine the following values at this instant:

(i) the moment of inertia *I* used for the next question (ii) [選定下一小題(ii)用的旋轉軸，並依此算 *I*][5%],

(ii) the angular acceleration α of the disk [5%],

(iii) the normal and tangential components (O_n , O_t) of reaction of the pin *O* on the disk [10%].

(3) As shown in Fig. 3, block A has a mass 0.4-kg and is attached to a spring having a stiffness $k = 24.6$ N/m and unstretched length $l_0 = 1$ m. If another block B, having a mass 0.3-kg, is pressed against A so that the spring deforms a distance $d = 0.3$ m. Both blocks slide on the smooth surface. Before they begin to separate, what is their velocity *v* at this instant? [10%]

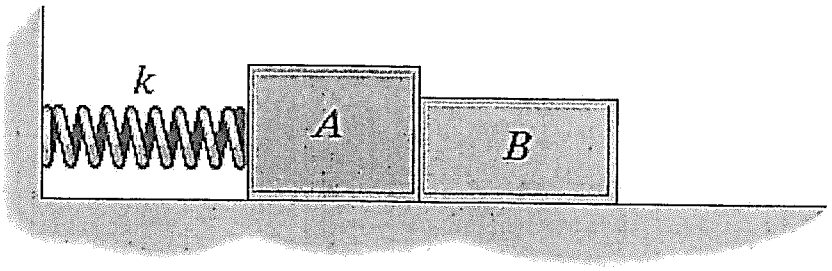

Fig. 3

(4) At the given instant member AB has the angular motions shown in Fig. 4. Determine the following values at this instant: member BC's angular velocity ω_{BC} [5%], slider block C's velocity v_C [5%], Pin B's normal acceleration $(a_B)_n$ [5%], pin B's tangential acceleration $(a_B)_t$ [5%], member BC's angular acceleration α_{BC} [5%], slider block C's acceleration a_C [5%].

(5) As shown in Fig. 5, the block has a weight of 80 kg and rests on floor for which the coefficient of kinetic friction is $\mu_k = 0.3$. If the motor draws in the cable at constant rate of 6 m/s, (1) determine the acceleration of the block [10%]. (2) Determine the output (W) of the motor at the instant $\theta = 40°$ by (method 2a) using the velocity of the block and total force on it [5%]; by (method 2b) using the cable tension and velocity (6 m/s) drawn by the motor [5%]. Neglect the mass of the cable and pulleys.

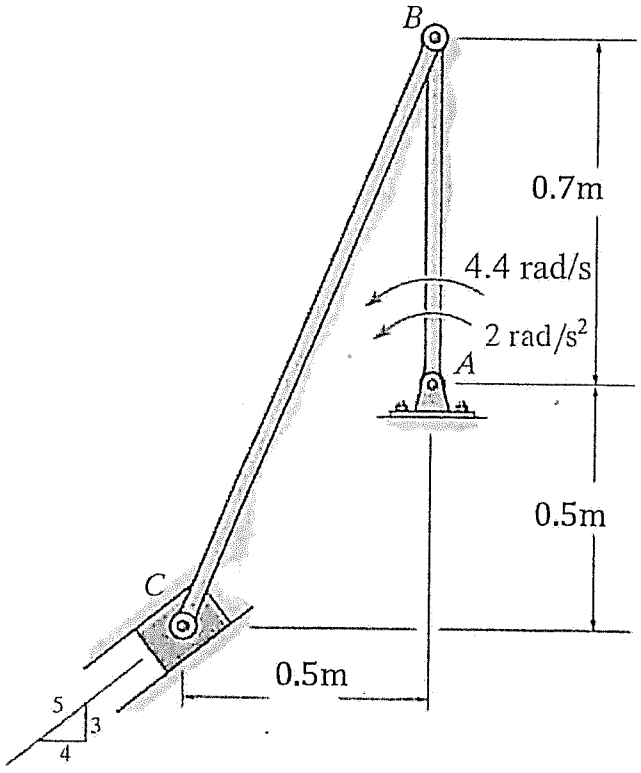

Fig. 4

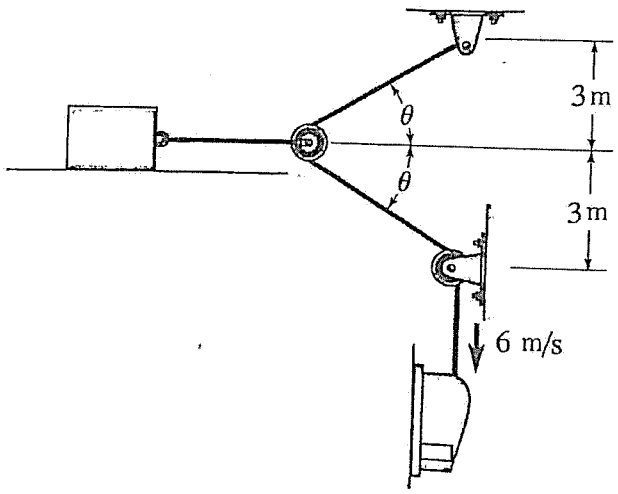

Fig. 5