國立成功大學

113學年度碩士班招生考試試題

編　號：123

系　所：系統及船舶機電工程學系

科　目：動力學

日　期：0201

節　次：第 2 節

備　註：可使用計算機

編號：123

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※ 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。

請注意，所有問題請以數字作答。重力加速度 $g = 9.81\ \text{m/s}^2$，圓周率 $\pi = 3.14\ \text{rad}$。

(1) See Fig. 1. If the car decelerates uniformly along the curved road from 23 m/s at *A* to 15 m/s at *C*, determine the velocity v_B [10%] and acceleration a_B [10%] of the car at *B*.

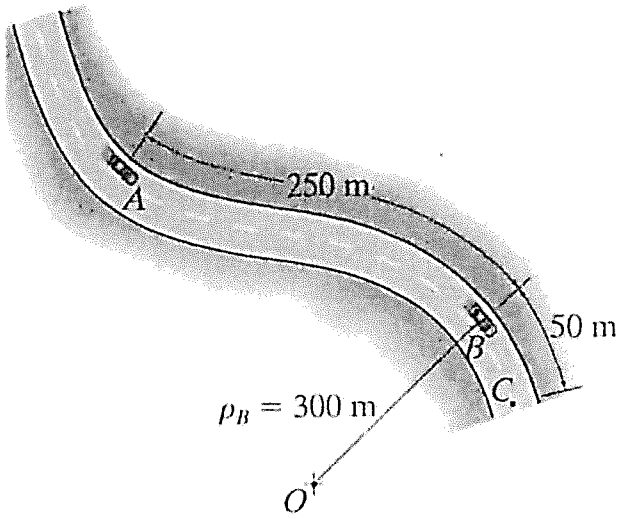

Fig. 1

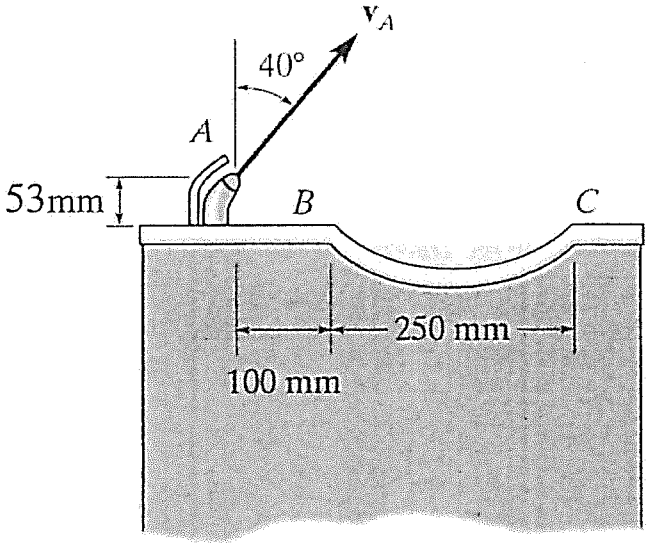

Fig. 2

(2) The drinking fountain is designed such that the nozzle is located from the edge of the basin as shown in Fig. 2. Determine the maximum and minimum speed: $\mathbf{v}_A)_{\max}$ [10%] and $\mathbf{v}_A)_{\min}$ [10%] at which water can be ejected from the nozzle so that it does not splash over the sides of the basin at *B* and *C*.

(3) See Fig. 3. Two disks *A* and *B* each have a mass of 1 kg and the initial velocities shown just before they collide (subscript 1). If the coefficient of restitution is $e = 0.66$, determine the *x*- and *y*-component of the velocity of disk *A* and *B* just after impact (subscript 2): $(v_A)_{2x}$=? [5%] $(v_A)_{2y}$=? [5%] $(v_B)_{2x}$=? [5%] $(v_B)_{2y}$=? [5%]

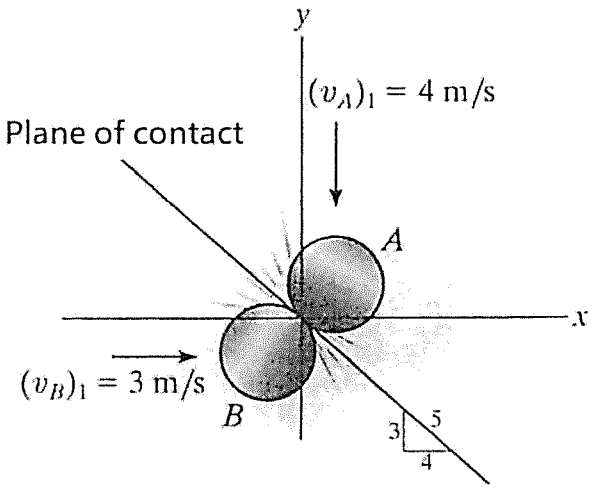

Fig. 3

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(4) As shown in Fig. 4, block A and B each have a mass 5-kg. For $\theta = 42°$, determine the largest horizontal force P [10%] which can be applied to B so that it will not slide on A. Also, what is the corresponding acceleration a? [10%] The coefficient of static friction between A and B is $\mu_S = 0.3$. Neglect any friction between A and the horizontal surface.

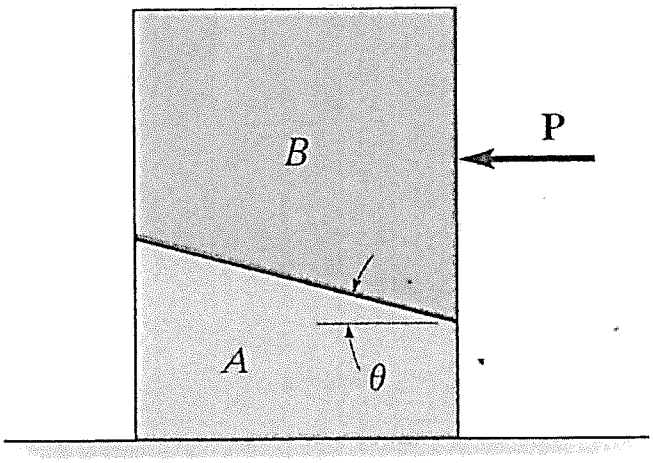

Fig. 4

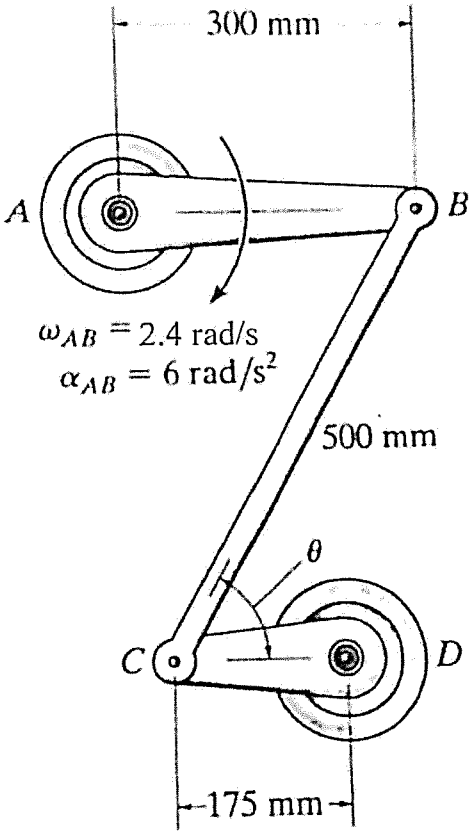

Fig. 5

(5) At the instant shown in Fig. 5, link AB has an angular velocity $\omega_{AB} = 2.4$ rad/ s and an angular acceleration $\alpha_{AB} = 6$ rad/ s^2. When $\theta = 60°$, at this instant determine: the angular velocity ω_{CB} of link CB and explain why [5%], the angular velocity α_{CB} of link CB [5%], the acceleration a_B of the pin at B [5%], the acceleration a_C of the pin at C [5%].