# 國立成功大學

# 110學年度碩士班招生考試試題

編　號：124

系　所：系統及船舶機電工程學系

科　目：動力學

日　期：0202

節　次：第 2 節

備　註：可使用計算機

※ 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。

1. As shown in Fig. 1, the platform is rotating about the vertical axis such that at any instant its angular position is $u = (4t^{3/2})$ rad, where $t$ is in seconds. A ball rolls outward along the radial groove so that its position is $r = (0.1t^3)$ m, where $t$ is in seconds. Determine the magnitudes of the velocity $v$ [10%] and acceleration $a$ [10%] of the ball when $t = 1.7$ s.
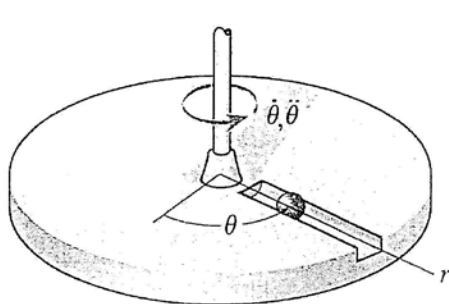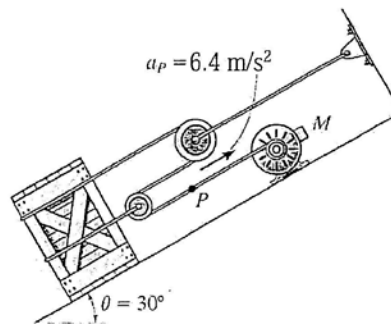


Fig. 1



Fig.2

2. As shown in Fig.2, The motor $M$ pulls in its attached rope with an acceleration $a_p = 6.4$ m/s$^2$. Determine the towing force $T_M$ [10%] exerted by $M$ on the rope in order to move the 50-kg crate up the inclined plane. The coefficient of kinetic friction between the crate and the plane is $\mu_k = 0.3$. Neglect the mass of the pulleys and rope. Also, determine the acceleration of the crate $a_c$ [10%].

3. As shown in Fig. 3, the 12-kg slender rod is pinned to a small roller $A$ that slides freely along the slot. If the rod is released from rest at $\theta = 0°$, determine the angular acceleration $\alpha$ [10%] of the rod and the acceleration $a_A$ [10%] of the roller immediately after the release.
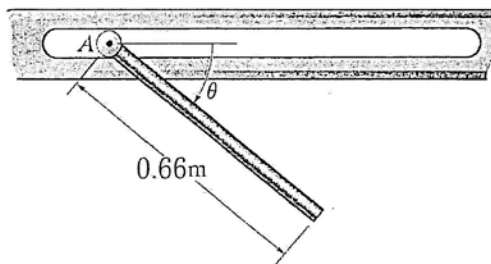


0.66m

Fig. 3

4. Two smooth billiard balls A and B have an equal mass of m = 200 g. If A strikes B with a velocity of $(v_A)_1$ = 2.3 m/s as shown in Fig. 4a. Ball B is originally at rest and the coefficient of restitution is e = 0.72. Line of impact is along the x-axis. Determine their final velocities (magnitudes in m/s) and moving directions (degree) just after collision: $(v_A)_2$, $\theta_2$, $(v_B)_2$, $\phi_2$, see Fig. 4b. [20%]
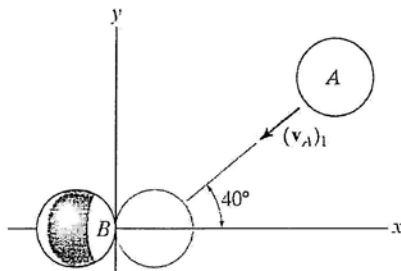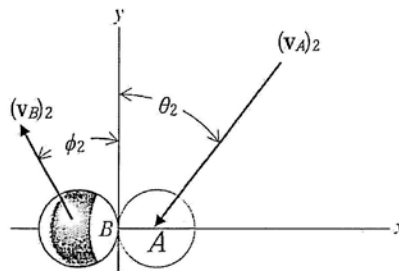


Fig. 4a Right before collision

Fig. 4b Just after collision

5. At the given instant member AB has the angular motions shown in Fig. 5. Determine the velocity $v_C$ [10%] and acceleration $a_C$ [10%] of the slider block C at this instant.
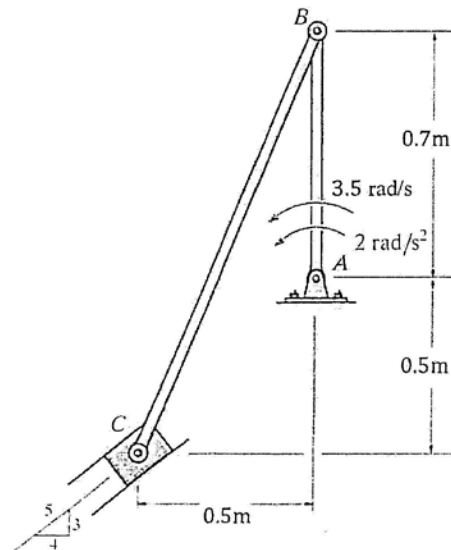


Fig. 5