109 A702

國立臺北科技大學 109 學年度碩士班招生考試

系所組別：1501 自動化科技研究所

第二節　工程力學　試題（選考）

注意事項：

1. 本試題共五題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、As shown in Fig. 1, rotation of the radially slotted arm is governed by $\theta = 0.2t + 0.02t^3$, where θ is in radians and t is in seconds. Simultaneously, the power screw in the arm engages the slider P and controls its distance from O according to $r = 0.2t + 0.04t^2$, where r is in meters. Calculate the magnitudes of the velocity and acceleration of the slider for the instant when t=3s. (20%)

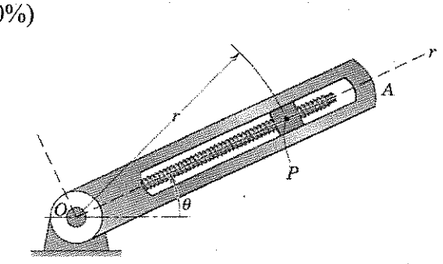

Fig. 1

二、As shown in Fig.2, the 10kg slider moves with negligible friction up the inclined guide. The attached spring has a stiffness of 60N/m and is stretched 0.6m in position A, where the slider is released from rest. The 250 N force is constant and the pulley offers negligible resistance to the motion of the cord. Calculate the velocity Vc of the slider as it passes point C. (20%)

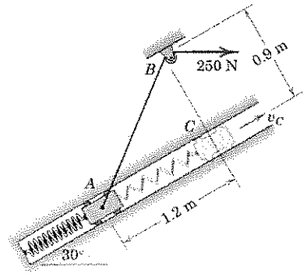

Fig. 2

三、As shown in Fig. 3, a small sphere has the position and velocity indicated in the figure and is acted upon by the force F. Determine the angular momentum H_O about point O and the time derivative $\dot{H}_O$. (20%)

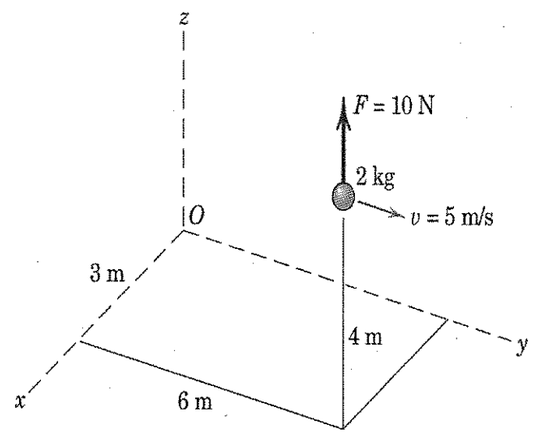

Fig. 3

四、As shown in Fig. 4, each of the three balls has a mass m and is welded to the rigid equiangular frame of negligible mass. The assembly rests on a smooth horizontal surface. If a force F is suddenly applied to one bar as shown, determine

(a) the acceleration of point O . (10%)

(b) the angular acceleration of the frame. (10%)

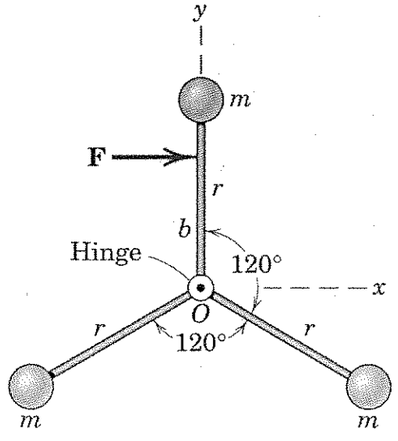

Fig. 4

注意：背面尚有試題

五、As shown in Fig.5, the forces **F**1, **F**2, and **F**3, all of which act on point *A* of the bracket, are specified in three different ways. Determine the *x* and *y* scalar components of each of the three forces. (20%)

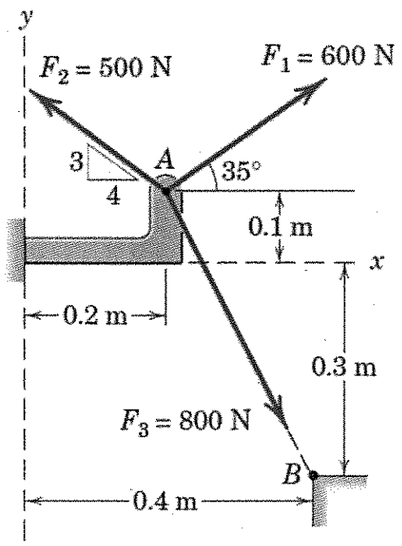

Fig. 5