國立彰化師範大學 102 學年度碩士班招生考試試題

系所：車輛科技研究所　　選考丙　　科目：動力學

☆☆請在答案紙上作答☆☆　　

1. Collar *A* and block *B* are connected by a cable passing over three pulleys *C*, *D*, and *E* as shown in Fig. 1. Pulleys *C* and *E* are fixed, while *D* is attached to a collar which is pulled downward with a constant velocity of 3 in./s. At t=0, collar *A* starts moving downward from position *K* with a constant acceleration and no initial velocity. Knowing that the velocity of collar *A* is 12 in./s as it passes through point *L*, determine the change in elevation, the velocity, and the acceleration of block *B* when collar *A* passes through *L*.(20%)

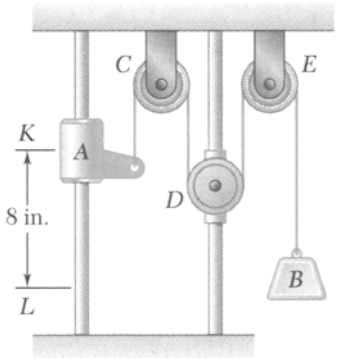

Fig. 1

2. As shown in Fig.2, the 12-lb block *B* starts from rest and slides on the 30-lb wedge *A*, which is supported by a horizontal surface. Neglecting friction, determine (a) the acceleration of the wedge, (b) the acceleration of the block relative to the wedge. (20%)

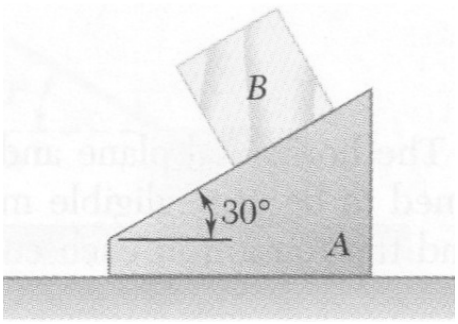

Fig. 2

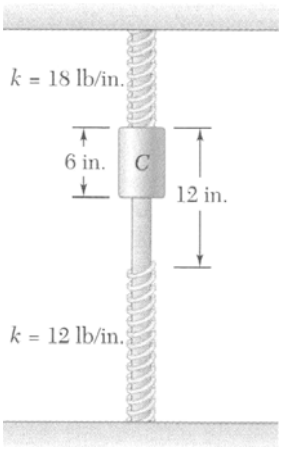

Fig. 3

3. A 6-lb collar *C* slides on a frictionless vertical rod. It is pushed up into the position shown in Fig. 3, compressing the upper spring 2 in. and released. Determine (a) the maximum deflection of the lower spring, (b) the maximum velocity of the collar. (20%)

4. The magnitude and direction of the velocities of two identical frictionless balls before they strike each other are as shown in Fig.4. Assuming e=0.90, determine the magnitude and direction of the velocity of each ball after the impact. (20%)

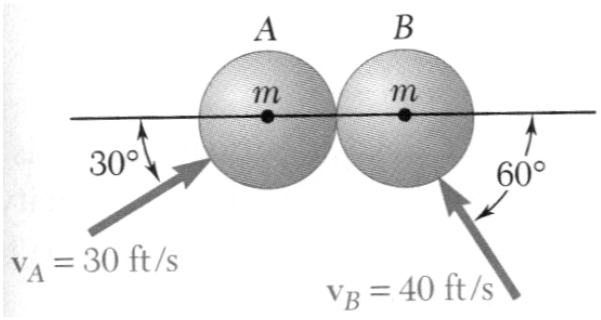

Fig. 4

5. As shown in Fig. 5, a projectile is fired with an initial velocity of 800ft/s at a target *B* located 2000ft above the gun *A* and at a horizontal distance of 12000ft. Neglecting air resistance, determine the value of the firing angle α . (20%)

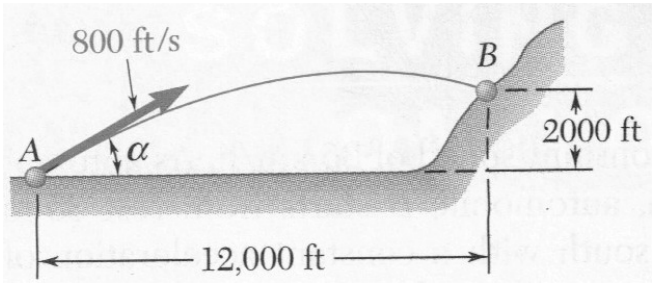

Fig. 5