

系別：航空太空工程學系

科目：動力學

准帶項目請打「V」	
✓	計算機

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1. The 1.2 kg slider is released from rest in position A and slides without friction along the vertical plane guide shown in Figure 1. Determine
- the speed v_B of the slider as it passes position B
 - the maximum deflection δ of the spring.
- (25%)

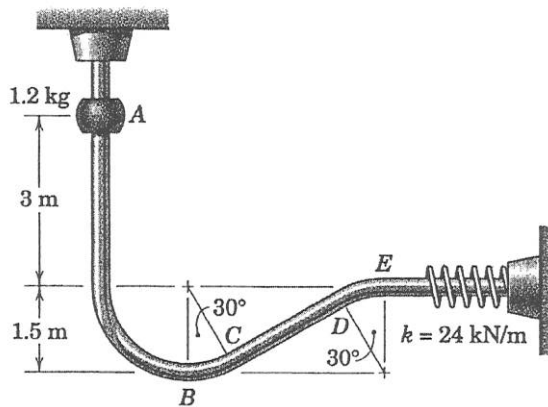


Figure 1

2. The space shuttle launches an 800 kg satellite by ejecting it from the cargo bay as shown in Figure 2. The ejection mechanism is activated and is in contact with the satellite for 4 second to give it a velocity of 0.3 m/s in the z -direction relative to the shuttle. The mass of the shuttle is 90,000 kg. Determine the component of the velocity v_f of the shuttle in the minus z -direction resulting from the ejection. (25%)

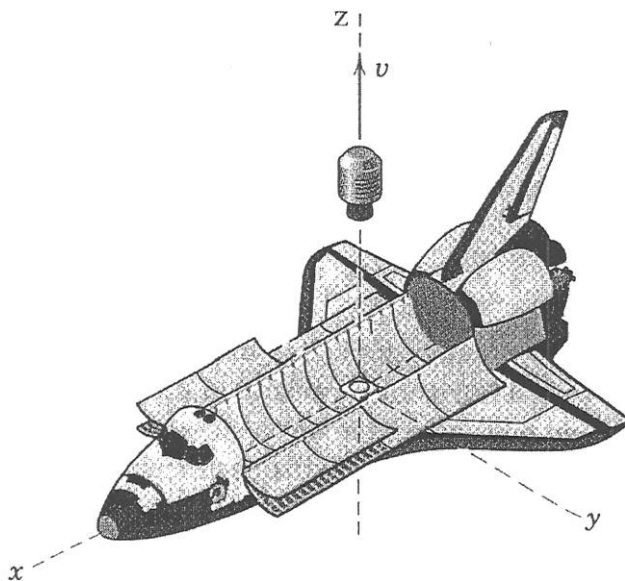


Figure 2

本試題雙面印製

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3. A 30,000 lb airplane with tricycle landing gear makes a hard two-wheel landing in soft ground so that the vertical ground reaction is 135,000 lb and the horizontal ground reaction is 45,000 lb. The moment of inertia about the center of gravity is 2,500,000 lb-s²-in, and the dimensions are shown in Figure 3. Please Find the angular velocity of the airplane and the vertical velocity of the nose wheel reaches the ground, if the nose wheel is 40 in from the ground when the main wheels touch the ground, assuming no appreciable change in the moment arms. The airplane's center of gravity has a vertical velocity of 12 ft/s at the moment of impact, and the ground reactions are assumed constant until the vertical velocity reaches zero, at which time the vertical ground reaction becomes 30,000 lb and the horizontal ground reaction becomes 10,000 lb. (25%)

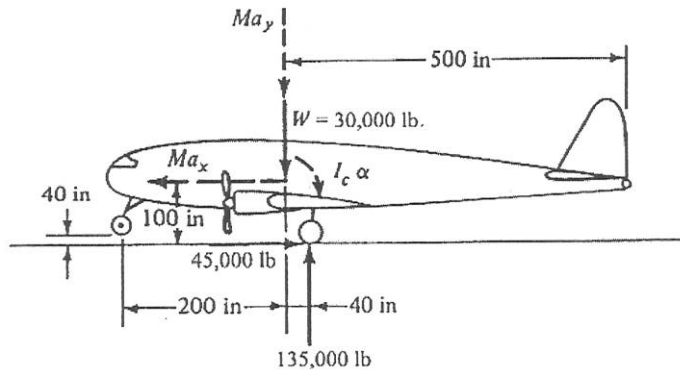


Figure 3

4. The airplane in Figure 4 is maneuvered by giving the control stick an abrupt forward displacement so that the airplane is given a pitching acceleration 6 rad/s². The moment of inertia of the airplane about a pitching axis through the center of gravity is 180,000 lb-s²-in. and the airplane weighing 8,000 lb.
- (1) Find the tail load and inertia force of the airplane if the wing lift is 67,200 lbs. (Figure 5) (10%)
 - (2) Find the time required for the airplane to pitch through an angle of 3° .(If the pitching acceleration is constant) (15%)

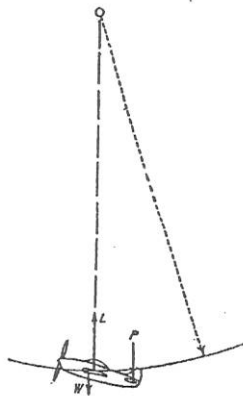


Figure 4

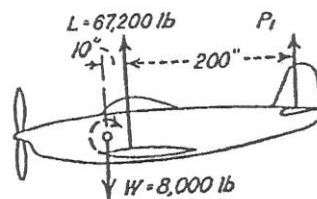


Figure 5