

系所組別 民航研究所

考試科目 普通物理

考試日期：0307，節次：2

※ 考生請注意：本試題 可 不可 使用計算機

1. (20%) Consider the motion of a particle in a uniform gravitational field.

- (a) Derive an equation for the trajectory (in x - y plane) of a particle moving with initial velocity v_0 at an angle θ above the horizontal in a uniform gravitational field g .
- (b) For the case of a trajectory over a flat surface, find the optimal initial angle θ that leads to the maximum range.

2. (15%) Block A can slide relative to block B , which can slide on a perfectly smooth horizontal plane as shown. If block A is given an initial velocity v_0 , find the final velocities of the two blocks and the distance that A slides relative to B . Assume that the coefficient of sliding friction between A and B is μ and A always stays on B .



3. A thin, rigid rod $L = 8$ m long pivots freely about one end. The rod is initially deflected $\theta_i = 6^\circ$ from the vertical with an angular velocity of $d\theta/dt = 3^\circ/\text{sec}$ (15%)

- (a) Determine the time dependence $\theta(t)$.
- (b) By what angle is the rod deflected at $t = 9$ s?

4. Calculate the weight of air (in pounds) contained within a room 20 ft long, 15 ft wide, and 8 ft high. Assume standard atmospheric pressure and temperature of 2116 lbf/ft^2 and 59°F , respectively. (15%)

(背面仍有題目,請繼續作答)

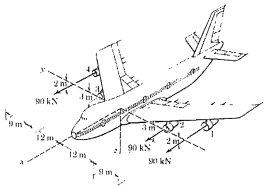
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5. (20%) The commercial airliner shown below with three-dimensional information provided. If engine 3 suddenly fails, determine the resultant of the three remaining engine thrust vectors, each of which has a magnitude of 90 kN. Specify the y- and z-coordinates of the point through which the line of action of the resultant passes.



6. (15%) A jet airplane having a mass of 8 Mg is flying horizontally at a constant speed of 1,000 km/hr under a thrust of 16 kN from its turbojet engines. If the pilot increases the fuel rate to give a thrust of 20 kN and noses the plane upward to maintain a constant 1,000 km/hr air speed, determine the angle θ made by the new line of flight with the horizontal. Note that the air resistance in the line of flight at the particular altitude involved is a function of air speed. Also, the lift L of the wings remains normal to the direction of flight.

