

航太所 民航組/太空組 物理學

1. 解釋名詞 (15%)

- 都普勒效應(Doppler Effect)
- 楞次定律(Lenz's Law)
- 安培右手定則(Ampere's Right Hand Screw)
- 牛頓萬有引力定律(Newton's Law of Gravitation)
- 法拉第定律(Faraday's Law)

2. 汽車玻璃上的反射鍍膜的問題 (15%)

A plastic film with index of refraction 2.50 is put on the surface of a car window to increase the reflectivity and keep the interior of the car cooler. The window glass has index of refraction 1.60. (a) What minimum thickness is required if light of wavelength 600 nm reflected from the two side of the film is to interfere constructively? (b) Explain the physical meaning of its key point for such light interference technique.

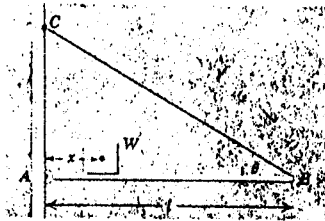
3. 飛機空氣升力的基本問題 (15%)

Air is streaming horizontally past a small airplane's wings such that the speed is 50.0 m/s over the top surface and 30.0 m/s past the bottom surface. If the airplane has a mass of 700 Kg and wing area of 9.00 square meters, and the air density is 1.20 Kg per cubic meter. (a) What theory or law is applied to this problem? (b) What is the net force (including the effects of gravity) on the airplane?

4. 有關電橋的問題 (15%)

Wheatstone bridge is used to determine the value of an unknown resistor (R_x) by comparison with other three resistors (R_1, R_2, R_3). (a) Try to draw the bridge circuit with a voltage source (V) and a galvanometer (G). (b) Formulate the relationship of these four resistors, and describe how to process the measurement.

- 5 (20%) A thin horizontal bar AB of negligible weight and length l is pinned to a vertical wall at A and supported at B by a thin wire BC that makes an angle θ with the horizontal. A weight W can be moved anywhere along the bar as defined by the distance x from the wall (a) Find the tensile force T in thin wire as a function of x (b) Find the horizontal and vertical components of the force exerted on the bar by the pin at A.



- 6 (20%) Two identical blocks, each of mass M , are connected by a light string over a pulley of radius R and rotational inertia I . The pulley has no friction with the bearing support. The string does not slip on the pulley. When this system is released, it is found that the pulley turns through an angle θ in time t and the acceleration of the blocks is constant (a) What is the angular acceleration of the pulley (b) What is the acceleration of the two blocks (c) What are tensions T_1 and T_2 . All answers are expressed in terms of M, I, R, θ, g and t .

