

系所組別： 航空太空工程學系在職專班甲組

考試科目： 航空工程概論（專班）

考試日期： 0219，節次： 3

※ 考生請注意：本試題 可 不可 使用計算機

- At 12 km in the standard atmosphere, the pressure, density, and temperature are $1.9399 \times 10^4 \text{ N/m}^2$, $3.1194 \times 10^{-1} \text{ kg/m}^3$, and 216.66 K, respectively. Assuming an isothermal region, calculate the standard atmospheric values of pressure, density, and temperature at an altitude of 18 km. (20%)
- An airplane is flying at a standard altitude of 25,000 ft with density ratio to sea level density of 0.4481 and at a velocity of 700 ft/sec. How fast must the airplane be flying to experience the same dynamic pressure at sea level? (15%)
- A light airplane weighs 2,650 lbf and has a wing area of 174 ft^2 . Estimate its sea level stall speed if the maximum lift coefficient is 1.8. (15%)

Note:

1.

$R_{\text{specific for air}}$	Units
286.9	$\text{J kg}^{-1} \text{K}^{-1}$
53.3533	$\text{ft lbf lb}^{-1} \text{ } ^\circ\text{R}^{-1}$
1716.59	$\text{ft lbf slug}^{-1} \text{ } ^\circ\text{R}^{-1}$

Based on a mean molar mass
for dry air of 28.9645 g/mol

- The sea level standard value of air density: 1.229 kg/m^3 or $0.00237 \text{ slug/ft}^3$.

(背面仍有題目,請繼續作答)

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4. (20%) Explain briefly the following terms and concepts:
- (a) aerodynamic coefficients,
 - (b) Fatigue failure
 - (c) Composite materials
 - (d) Stress and strain
5. (10%) In aircraft design, what are the major concerns in selecting appropriate structural materials?
6. (20%) The figures below show an airplane flying in the vertical plane and its free body. The forces acting on the plane are its weight W , the thrust T exerted by its engines, and the aerodynamic forces, which are resolved into a component perpendicular to the path, the lift L , and a component parallel to the path, the drag D . The angle γ between the horizontal and the path is called the flight path angle, and α is the angle of attack. If $\gamma = 6^\circ$, $D = 125$ kN, $L = 680$ kN, and the mass of the airplane is 72,000 kg, what values of T and α are necessary to maintain steady flight?

