

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：0223，節次：3

※ 考生請注意：本試題不可使用計算機

1. (25%) Explain briefly the following terms and concepts:

- (a) strength and stiffness,
- (b) stress and strain,
- (c) fatigue failure,
- (d) inertial force,
- (e) CNS/ATM.

2 (25%)

- (a) In modern aircraft design, what are the major considerations in selecting appropriate structures and materials?
- (b) What is *composite material* and why is it important in modern aircraft structures?

(背面仍有題目,請繼續作答)

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3. Consider an airplane flying at a standard altitude of 3 Km with a velocity of 70m/s, at a point on the wing of the airplane, the velocity is 80 m/s. Calculate the pressure at this point.

(Note: At 3Km Temperature =  $-4.49^{\circ}\text{C}$ , Density =  $0.9093 \text{ kg}\cdot\text{m}^{-3}$ , Pressure =  $7.012 \times 10^4 \text{ N/m}^2$ ) (15%)

4. Consider the Northrop F-5 fighter airplane, which has a wing area of  $180 \text{ ft}^2$ . The wing is generating 19000 lb of lift. For flight velocity of 250 mi/hr at stand sea level, calculate the lift coefficient.

(Note: At sea level Temperature =  $15^{\circ}\text{C}$ , Density =  $1.225 \text{ kg}\cdot\text{m}^{-3}$  or  $0.002377 \text{ slug/ft}^3$ , Pressure = 14.697 psi.

1 mi/hr = 88/60 ft/s) (15%)

5. Consider an airplane of weight 38220N, wing area is  $27.3 \text{ m}^2$ , aspect ratio is 7.5, Oswald efficiency factor is 0.9, and parasite drag coefficient  $C_{D,0} = 0.03$ . To fly at a velocity of 350Km/hr at standard sea level,

Calculate (a) the induced drag,

(b) total drag,

(c) the thrust required.

(Note: Induce Drag Coefficient =  $\frac{C_L^2}{\pi \cdot AR \cdot e}$ , where  $C_L$  is lift coefficient, AR is aspect ratio, and e is Oswald efficiency factor) (20%)