※ 考生請注意：本試題 ☑可 □不可 使用計算機

1. The atmosphere of Jupiter is essentially made up of hydrogen H_2. For H_2 the specific gas constant is 4157 $J/Kg \cdot K$. The acceleration of gravity on Jupiter is 24.9 m/s^2 Assuming an isothermal atmosphere with a temperature of 150 K and assuming that Jupiter has a definable surface, calculate the altitude above that surface where the pressure is one-half the surface pressure.   (15%)

2. An airplane is flying at a velocity of 130 mile /hour at a standard altitude of 5000 ft. At a point on the wing, the pressure is 1750.0 lbf/ft^2 Calculate the velocity at that point, assuming incompressible flow.   (15%)
   Note: The density and pressure at 5000 ft are $\rho = 2.0482 \times 10^{-3} \, slug/ft^3$
   and $P_\infty = 1760.9 \; lbf/ft^2$

3. Describe the differences in the effects on wing lift from trailing edge flap deflection and from leading edge devices.   (20%)

4. (25%) Explain briefly the following terms and concepts:
   (a) strength and stiffness,
   (b) CNS/ATM
   (c) Fatigue failure
   (d) Composite materials
   (e) Creep and relaxation

5. (12%) Based on Newton's second law, derive the equations of motion in the directions parallel and perpendicular to the flight path, respectively, for an airplane in climbing flight with a climbing angle θ.

6. (13%) Consider an airplane of speed V in a level turn of radius R and with a roll angle ϕ. Define the lift load factor $n = L/W$. Show that the turn radius can be expressed as

$$R = \frac{V^2}{g\sqrt{n^2 - 1}}$$ (Note: $W = mg$)