1. (30%) Explain briefly the following concepts:

   (a) inertial force and load factor

   (b) aerodynamic coefficients

   (c) stresses and strains,

   (d) strength and stiffness,

   (e) CNS/ATM

2. (20%) Consider an airplane in climbing flight with a climbing angle θ and a thrust angle ϕ.

   (a) What are the major forces acting on the airplane?
       Please sketch to describe the directions of these forces.

   (b) Based on Newton's second law, derive the equations of motion in the directions parallel and perpendicular to the flight path, respectively.

3. (20%) What is gas generator (core engine)? Please classify gas turbine engine at least four application to the aircraft or power system?

4. (20%) What is the convergent divergent nozzle? Please draw a diagram to show its pressure, velocity and Mach no. distribution along the axis?

5. (10%) What is wing tip vortices? Please discuss its effect to the aircraft?