

III B.Tech II Semester Regular/Supplementary Examinations, May 2010
Flight Mechanics-II
Aeronautical Engineering

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the effect of centre of gravity location on the stability of an aircraft.
(b) Estimate the side wash gradient for the vertical tail using vortex model method. [8+8]
2. Explain the aerodynamic forces on a stabilator configuration in stick free condition of an airplane. [16]
3. The aerodynamic forces and moments on the body are due to only two basic sources as given below. Explain them with sketches
(a) Pressure distribution over the body surface
(b) Shear stress distribution over the body surface. [8+8]
4. What are the two broad categories of aircraft flight controls? Explain them in detail with figures. [16]
5. Describe the need for controls in airplane associated with the static and dynamic stabilities of an airplane. [16]
6. Draw typical variation of $(d \delta_e / d \eta)$ versus centre of gravity position as a per cent of mean aerodynamic chord. Explain the variations. [16]
7. Bring out the relationship between yaw and roll of an airplane in the following cases:
(a) Rolling moment with yaw rate
(b) Yawing moment with roll rate. [8+8]
8. The characteristic equation of dynamic longitudinal stability of an airplane is $A \lambda^4 + B \lambda^3 + C \lambda^2 + D \lambda + E = 0$,
where $A = 1.0$, $B = 13.4$, $C = 67.4$, $D = 394$, $E = -73.8$.
Find the short period and phugoid period of oscillations.
Assume any other data necessary for the computation, but not given here, with necessary explanations. [16]
