

R09

Code No: 09A82109

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, May - 2013

Aero Elasticity

(Aeronautical Engineering)

Time: 3 Hours

Max. Marks:

Answer any Five Questions
All Questions Carry Equal Marks



1. Explain the importance of aero-elastic effects in flight vehicle design. Describe and explain Collar's Aero-elastic Triangle with the help of sketches. [15]
2. Derive expressions for the aerodynamic forces on an oscillating wing. [15]
3. Derive the equations of equilibrium of a system based on Hamilton's principle and Lagrange's equations.
4. a) What are control effectiveness and control reversal? [6]
b) Explain the effect of elastic deformation on the longitudinal stability of an airplane. [9]
5. a) Explain the importance of dimensional similarity in flutter analysis. [9]
b) Explain dynamic mass balancing with the help of simple experiments. [6]
6. If the pressure on the lifting surface is $\Delta p(x,y,z,t)$ and deformation of the lifting surface $Z(x,y,z,t) = \Phi(x,y,z)e^{i\omega t}$ then derive the general aero-elastic equation in modal coordinate. [15]
7. a) What is a flutter determinant explain. [6]
b) Derive the equation of motion of a typical section of a structure for bending-torsion degrees of freedom. [9]
8. What is the difference between galloping and flutter? Explain the flow-induced vibrations of suspension Bridges. [6]

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