CODE NO: 07A82109 | **R07** | **SET No - 1**

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
AEROELASTICITY
(AERONAUTICAL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Explain collar diagram with the help of figure.
b) Explain Aeroservoelasticity and Aerothermoelasticity. [8+8]

2. Explain the physical phenomena of Fluid flow through a flexible pipe with the help of figure and equations. [16]

3. Explain and Derive the Lagrange's equation of motion for the mechanical systems. [16]

4. How the aerodynamic heating effect will act on large aspect – ratio straight wing. [16]

5. Explain the importance of non-dimensional parameters in Flutter analysis. [16]

6. Discuss the Linear differential operators with a single independent variable. [16]

7. Explain the influence of flexibility in the controls in static problems. [16]

8. Explain the Aero Elasticity Applications in Aerospace Engineering problems. [16]

* * * * * *

CODE NO: 07A82109

R07

SET No - 2

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
AEROELASTICITY
(AERONAUTICAL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. Derive the equation for elastic twist (α_e) of simplified static Aeroelastic system consists of a rigid, flat, plate airfoil mounted on a torsional spring attached to a wind tunnel wall. [16]

2. Explain the swept wing Divergence of the wing modeled by the bending torsion deformation of a beam rod with the help of swept wing geometry figure and velocity diagram in the x, y plane. [16]

3. Explain Dynamic Mass Balancing of 2D wing of infinite torsional rigidity fitted with an aileron whose center of mass lies behind the hinge line. [16]

4. Explain the effect of elastic deformation on the static longitudinal stability of an airplane. [16]

5. Explain the dynamic mass balancing with the help of simple experiments. [16]

6. Explain
   a) Linear differential operators with several independent variables.
   b) Adjoint integral operators. [8+8]

7. Derive the equation for torsional aileron divergence. [16]

8. List out and explain the applications of Aeroelasticity in engineering problems. [16]

* * * * * *

CODE NO: 07A82109

R07

SET No - 3

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
AEROELASTICITY
(AERONAUTICAL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. Derive the equation for Dynamic pressure at reversal (q_R) of simplified static Aeroelastic system consists of a rigid, flat, plate airfoil mounted on a torsional spring attached to a wind tunnel wall with control surface. [16]

2. Explain two dimensional structure- integral representation, 2D aerodynamic surface-integral representation and solution by matrix – lumped element approach. [16]

3. Derive the equations of equilibrium of the system based on Hamilton's principle and Lagrange's Equations. [16]

4. Derive the equation for rolling power of the elastic wing. [16]

5. Explain the importance of dimensional similarity in flutter analysis. [16]

6. What are the different solutions of the equations of Aeroelasticity. Explain Galerkins method. [16]

7. Explain the treatment of the torsional degree of freedom and divergence with the help of figures. [16]

8. Explain the flow induces vibration of slender structures. [16]

* * * * * *

CODE NO: 07A82109 | R07 | SET No - 4

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
AEROELASTICITY
(AERONAUTICAL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. Explain and derive the equations for Integral equation of equilibrium and derivation of equation of equilibrium for Rolling of a straight wing. [16]

2. Derive the equations for two dimensional aeroelastic model of Lifting surfaces. [16]

3. Prove that Hamilton's principle depends upon the existence of a Isothermal potential function F_0 having the special properties stated by
$[(\partial F_o)/ (\partial \varepsilon_x)] = \sigma_x$, $[(\partial F_o)/ (\partial \varepsilon_y)] = \sigma_y$, $[(\partial F_o)/ (\partial \varepsilon_z)] = \sigma_z$,
$[(\partial F_o)/ (\partial \gamma_{xy})] = \tau_{xy}$, $[(\partial F_o)/ (\partial \gamma_{xz})] = \tau_{xz}$, and $[(\partial F_o)/ (\partial \gamma_{yz})] = \tau_{yz.}$ [16]

4. How the symmetrical load distribution and divergence will effect on large aspect-ratio straight wing (static). [16]

5. Explain the stiffness criteria in flutter analysis. [16]

6. Explain the manipulation of linear aeroelastic operators. [16]

7. Explain the effect of a control surface or spoiler in static problems. [16]

8. Explain the flow induces vibrations of suspension bridges. [16]

* * * * * *