

IV B.Tech. II Semester Regular Examinations, April/May -2006
AEROELASTICITY
(Aeronautical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the phenomenon of galloping of the transmission lines.
(b) What is control reversal? Discuss the factors affecting it. [16]
2. What do you mean by flutter, what factors are responsible for occurrence of flutter, describe any one of the factor in detail. [16]
3. Derive an expression for the divergence speed for a simple two-dimensional wing with aileron. What are the means to prevent aileron reversal. [16]
4. Describe Galerkin's method for obtaining approximate solution of aeroelastic problems. [16]
5. Deduce the integral equation of motion for free vibrations of a slender restrained wing.
6. Define divergence speed, flutter speed and control reversal speed. Compare all the speeds for an airplane. [16]
7. Plot the variation of aileron efficiency w.r.t dynamic pressure for different ratios of dynamic pressures for divergence and reversal. [16]
8. Write short notes on the following:
 - (a) Wing divergence
 - (b) Torsional divergence
 - (c) Galloping of transmission lines
 - (d) Flutter. [16]

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1. What is Aeroelasticity, discuss the various phenomenon related to it, which affect the performance of a flying aircraft. [16]
2. What do you mean by torsional divergence? Discuss the methods to find the divergence speed of a slender straight wing? [16]
3. How many types of control reversal can happen in the flying airplane? Discuss the different types and suggest remedies. Find the expression for the critical aileron reversal speed taking the general case. [16]
4. Use the Lagrange's equation to find the equation of motion of a rigid wing segment supported by a spring at its elastic axis. [16]
5. Define divergence speed, flutter speed and control reversal speed. Compare all the speeds for an airplane. [16]
6. What are the methods used for flutter analysis? Discuss the effect of aspect ratio on the flutter of an aircraft wing. [16]
7. Plot the variation of aileron efficiency w.r.t dynamic pressure for different ratios of dynamic pressures for divergence and reversal. [16]
8. Write short notes on the following
 - (a) Collar's triangle.
 - (b) Rigid wing
 - (c) Control reversal
 - (d) Buffeting. [16]

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1. (a) Define aeroelasticity and discuss the phenomenon of wing divergence.
(b) Draw and explain Coller's triangle. [16]
2. Derive the equation motion for flutter analysis in case of a swept back wing. [16]
3. Derive an expression for the aileron reversal speed for a simple two-dimensional wing. Discuss the aileron effectiveness as a function of Mach number for a jet transport. [16]
4. What do you mean by aileron reversal ? Why does it occur. Is it possible to come out of this mode in a flying aircraft? What are the means to prevent aileron reversal. [16]
5. Define divergence speed, flutter speed and control reversal speed. Compare all the speeds for an airplane. [16]
6. Describe Rayleigh-Ritz method for obtaining approximate solution of aeroelastic problems. [16]
7. What are the methods used for flutter analysis? Discuss the effect of aspect ratio on the flutter of an aircraft wing. [16]
8. Plot the variation of aileron efficiency w.r.t dynamic pressure for different ratios of dynamic pressures for divergence and reversal. [16]

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1. (a) Define aeroelasticity, draw and explain Collier's triangle.
(b) Explain the phenomenon of galloping of transmission lines. [16]
2. Derive the equation motion for flutter analysis in case of a swept back wing. [16]
3. Derive an expression for the divergence speed for a simple two-dimensional wing with aileron. What do you mean by torsional divergence? [16]
4. Deduce the integral equation of motion for forced motion of a slender restrained wing. [16]
5. How many types of control reversal can happen in the flying airplane? Discuss the different types and suggest remedies. Describe flutter in the wings of airplanes and the means to prevent flutter. [16]
6. Define divergence speed, flutter speed and control reversal speed. Compare all the speeds for an airplane. [16]
7. Plot the variation of aileron efficiency w.r.t dynamic pressure for different ratios of dynamic pressures for divergence and reversal. [16]
8. Write short notes on the following:
 - (a) Wing divergence
 - (b) Torsional divergence
 - (c) Galloping of transmission lines
 - (d) Flutter. [16]
