



## “University of Petroleum and Energy Studies”

Centre: Dehradun

Examination: End Semester Examination April 2017  
 Program & Branch: B.Tech (Aerospace Engineering)  
 Course Code: ASEG 451  
 Course Title: Aero-Elasticity

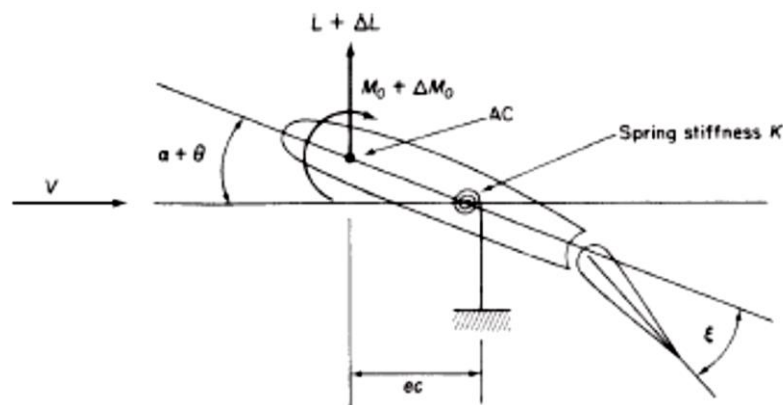
Semester: VIII  
 Duration: 3 hrs  
 Max. Marks: 100

### SECTION-A (4 x 5 = 20 MARKS)

1. Define the following: Aerodynamic center, center of pressure and Elastic axis.
2. Explain the different types of Aero-Elastic problems encountered on aircraft.
3. Describe the phenomenon of wing torsional divergence.
4. Explain the different methods to avoid the divergence speed.
5. What do you mean by control effectiveness and reversal?

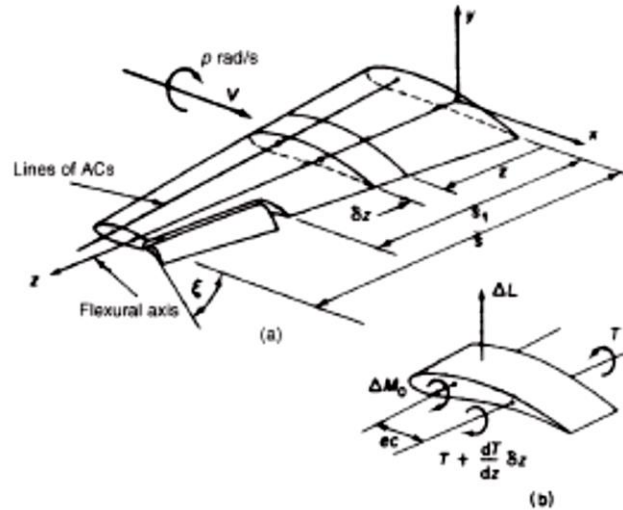
### SECTION – B (10 x 4 = 40 Marks)

6. What do you mean by Classical Flutter, Stall Flutter and Aileron buzz? Also, explain how to prevent the Aileron Buzz.
7. How would Aero-elastic interactions affect the performance of spacecraft or aircraft? Explain in details.
8. Define the term inertial coupling, Aerodynamic coupling and Elastic coupling. How can you overcome the problem of inertial coupling?
9. Derive the expression for control reversal speed for the combination as shown below.



**SECTION-C (20 x 2 = 40 MARKS)**

10. Derive the expression for twisting of the wing due to the Aileron deflection of the wing-control surface combination as shown in figure below.



11. Write short notes on the following: (4 x 5 = 20 Marks)

- I. Load Distribution.
- II. Buffeting.
- III. Thermal Instability
- IV. Control surface Flutter

**Or**

- I. Vortex shedding
- II. Aero-Elastic tailoring
- III. Collar's Triangle
- IV. Prevention of Aero-elastic Instabilities.