Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ANE) (Sem.–7,8)

AEROELASTICITY

Subject Code : ANE-412

Paper ID : [A2067]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION–A

1. Write briefly :

a) What is the basic reason for various types of aeroelastic phenomena in modern airplane structures?

b) What is buffeting phenomenon?

c) List five types of rapidly applied loads that cause dynamic response problems in airplane structures.

d) What were the reasons to preclude most aeroelatic phenomena prior of world war–II?

e) State the effect of sweep on the divergent speed of a conventional wing.

f) What is semi rigid theory? Explain briefly.

g) Sketch the variation of aileron effectiveness with mach number.

h) List the objects other than aircraft structures which experience troubles of aeroelastic origin.

i) Why is the problem of stall flutter not a serious one on wings and tails?

j) State the basic features of classical flutter.

SECTION–B

2. Making suitable assumptions, derive on expression for the wing torsional divergence speed in a two-dimensional flow.

3. Name the two classes of aeroelastic phenomena and indicate them on collar's triangle of forces.

4. Explain the physical phenomenon of aileron reversal and list the ways of avoiding it.

5. Derive the equations of motion for the flutter of a system with two degrees of freedom with the help of suitable diagram.

6. List and define the five dimensionless system parameters which influence the flutter speed of a wing.

SECTION–C

7. Determine the divergence dynamic pressure of an idealized wing by the method of generalized coordinates assuming GJ, c, a and e are constants and

$$f(y) = \frac{y}{s}$$

Derive the formula you may use.

The symbols have their usual meanings.

8. Show that

$$\frac{C_L}{C_L^r} = \frac{U_D^2(U_R^2 - U^2)}{U_R^2(U_D^2 - U^2)}$$

Where the symbols have their usual meanings.

9. Write notes on any **two** of the following:

(a) Galloping of 'transmission lines'.

(b) Method of successive approximation.

(c) Phenomenon of load distribution in aeroelasticity.