Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ANE) (Sem.–7,8)

AEROELASTICITY

Subject Code : ANE-412

M.Code : 70494

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

Q**1. Write briefly :**

a) Differentiate between static aeroelasticity and dynamic aeroelasticity.

b) List the static aeroelastic problems.

c) What is buffeting? How is it alleviated?

d) Define 'Control system reversal'.

e) What were the reasons for the absence of aeroelastic problems prior to World War-II?

f) List the effects of flutter on the design of high speed aircraft.

g) State the effect of dynamic loads on airplane design.

h) What is the effect of sweep on divergence speed of a wing?

i) Sketch the effect of speed on aileron effectiveness.

j) What are the degrees of freedom of the oscillating motion of a fluttering cantilever wing?

SECTION-B

Q2. Explain the effect of sweep on critical speeds with the help of a sweep versus speed diagram.

Q3. Making suitable assumptions and Saint-Venant's torsion theory, derive a differential equation for the determination of divergence speed of an idealized cantilever wing.

Q4. Derive a relation between $\frac{\partial C_L}{\partial \beta}$ and $\frac{\partial C_{mac}}{\partial \beta}$ that makes aiteron reversal speed of a wing equal to its divergence speed.

Q5. Describe the physical phenomenon of flutter.

Q6. Explain the phenomenon of galloping of transmission lines.

SECTION-C

Q7. Derive an expression for the aileron reversal speed of a two-dimensional wing in terms of $\frac{\partial C_L}{\partial \beta}$, $\frac{\partial C_L}{\partial \alpha}$ and $\frac{\partial C_{mac}}{\partial \beta}$ where the symbols have their usual meanings.

Q8. State semirigid theory. Making use of suitable assumptions and semirigid assumption, derive the following equation :

$$q_{div} a \int_0^s C^2(y)\, e(y) \frac{f^2(y)}{f^2(r)}\, dy = k$$

Q9. Write notes on :

a) Effect of aeroelasticity on static longitudinal stability of airplane.

b) Method of successive approximations.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.