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Total No. of Questions : 09

B.Tech.(Aerospace Engg.) (2012 Batch)   (Sem.–7,8)
AEROELASTICITY
Subject Code : ASPE-402
Paper ID : [72565]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS 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

Q1. Write briefly :

a) Explain the phenomenon of aeroelasticity in rigid wing.

b) Explain load redistribution under Aeroelasticity.

c) Explain any dynamic aeroelasticity phenomenon.

d) In conventional aircraft design which among main wing, horizontal tail, vertical tail and fuselage is more prone to undergo buffeting? Explain your choice.

e) What do you understand by aileron buzz?

f) Define critical flutter speed.

g) Differentiate between classic flutter and non-classic flutter.

h) Define center of independence.

i) Explain the effect of wing stiffness in static aeroelasticity problems of wing.

j) Is buffeting phenomenon an example of free vibration or forced vibration? Explain.

SECTION-B

Q2. What is flight flutter testing? Is it a replacement of wind tunnel flutter testing? Explain your answer.

Q3. Explain with help of diagram the coupling of bending and torsional oscillations. In the same context explain how geometric incidence of airfoil has destabilizing effect.

Q4. Derive the expression of wing divergence speed for finite wing (3d case). Take appropriate assumptions required.

Q5. Discuss methods for flutter prevention.

Q6. Discuss the difference between different types of dynamic aeroelasticity phenomenon.

SECTION-C

Q7. Answer the following :

a) What do you understand by aileron effectiveness?   (2)

b) For a two-dimensional case, when aileron is deflected by ξ produces change in wing lift and pitching moment, which in turn causes elastic twist θ. For such case, derive the expression for aileron reversal speed (V_r) and Aileron effectiveness.   (6)

c) If a given aircraft is flying at a speed, say V, such that its divergence speed is thrice the current speed and aileron reversal speed it twice the current speed. Calculate aileron effectiveness for the aircraft.   (2)

Q8. In context to experiments in aeroelasticity answer the following :

a) Explain the procedure to determine critical flutter speed experimentally.   (6)

b) What is scaling laws and how are they used in experimentation?   (2)

c) What are different methods used for excitation the structure and inducing flutter?   (2)

Q9. Explain, with the help of proper diagrams, the effect of wing sweep on :

a) Wing divergence speed.   (6)

b) Critical flutter speed.   (2)

c) Aileron reversal speed.   (2)