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Total No. of Printed Pages: 1

Total No. of Questions: [09]

**B. Tech (Aeronautical Engg.) (Semester – 6<sup>th</sup>)**

**AIRCRAFT STABILITY AND CONTROL**

**Subject Code: BANES1-603**

**Paper ID: 18110233**

**Time: 03 Hours**

**Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**Section – A**

**(2 marks each)**

Q1. Attempt the following:

- a) Write the criteria of longitudinal static stability.
- b) Define neutral point.
- c) Define elevator effectiveness.
- d) What do you understand by trim condition?
- e) What do you understand by the static margin?
- f) Name the parameters on which the hinge moment depends.
- g) Differentiate between stick free and stick fixed static longitudinal stability.
- h) Define the Dihedral Effect on lateral stability.
- i) How is maneuver flight differ from steady-level flight?
- j) Define the adverse Yaw.

**Section – B**

**(5 marks each)**

- Q2. How does the location of CG contribute to longitudinal static stability?
- Q3. Explain the contribution of different tail parameters to the longitudinal static stability of the aircraft.
- Q4. Discuss the Different types of tabs used on airplanes.
- Q5. What do you understand by stick-free stability?
- Q6. Find the expression for an increase in the angle of attack of the tail during the pull-up maneuver.

**Section – C**

**(10 marks each)**

- Q7. What do you understand by stick-fixed static stability? Find the expression of the static margin of stick-fixed longitudinal static stability.
- Q8. Prove that the stability level in stick-free maneuver flight is higher than that of corresponding steady-level flight.
- Q9. Consider a model of a wing-body shape mounted in a wind tunnel. The wing area and chord of the test model are  $2 \text{ m}^2$  and  $0.45$ , respectively, placed in the stream of air at  $110 \text{ m/s}$ . The moment about CG, when the lift is zero, is found to be  $-13 \text{ N-m}$ . When the model is pitched to another AOA, the lift and the moment about the CG are  $4000 \text{ N}$  and  $25 \text{ Nm}$ ., respectively. Calculate the value of the moment coefficient about the aerodynamic center and its location.