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10AE73

**Seventh Semester B.E. Degree Examination, Feb./Mar. 2022**  
**Aircraft Stability and Control**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.**

**PART – A**

- 1 a. Describe the following with neat sketch  
i) Static stability  
ii) Dynamic stability. (10 Marks)
- b. Explain wing contribution to  $M_{cg}$  and derive the expression. (10 Marks)
- 2 a. Describe stick fixed neutral point; write down the expression for stick fixed neutral point. (10 Marks)
- b. Explain the elevator power, and its effect on the longitudinal stability. (10 Marks)
- 3 a. Explain hinge moment parameter. (10 Marks)
- b. Derive the equation for stick free neutral point. (10 Marks)
- 4 Define static directional stability and discuss the contribution of airframe components to directional stability. (20 Marks)

**PART – B**

- 5 a. Define dihedral effect and describe on the aspect of estimation airplane dihedral effect. (10 Marks)
- b. Derive the expression for aileron control forces. (10 Marks)
- 6 a. Derive the equation of motion for longitudinal dynamic stick fixed case. (10 Marks)
- b. Explain the following :  
i) Phugoid mode  
ii) Short period mode. (10 Marks)
- 7 Describe the dynamic lateral stability considering rudder free case. (20 Marks)
- 8 a. Discuss Cooper Harper scale rating for flight handling Qualities. (10 Marks)
- b. Explain the following :  
i) Dutch roll  
ii) Spiral instability. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.