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10AE73

Seventh Semester B.E. Degree Examination, June/July 2018
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. Derive Expression for wing contribution $\left(\frac{d_{C_M}}{d_{C_L}}\right)_w$ for the longitudinal static stability of an airplane and discuss the significance of CG position with respect to aerodynamic centre. **(10 Marks)**

b. Explain the terms of equilibrium conditions, static stability , longitudinal static stability and stability criteria with relevant equations and graphs. **(10 Marks)**

2 a. Define Stick Fixed Neutral points. Write down the expression for stick fixed neutral point and discuss the effect of CG shift on pitching moment. **(06 Marks)**

b. Briefly explain about longitudinal control. **(08 Marks)**

c. Define Elevator power and how does elevator power affects the Longitudinal Stability. **(06 Marks)**

3 a. Explain Hinge moment parameters. **(06 Marks)**

b. Explain about Trim tabs. **(06 Marks)**

c. Derive the Equation for Stick Free Neutral points. **(08 Marks)**

4 a. Define Static directional stability of an airplane and the criteria with the relevant sketches and expressions. **(06 Marks)**

b. Explain about Adverse Yaw and Spin Recovery. **(08 Marks)**

c. Explain about "Rudder Lock" and "Dorsal Pin". **(06 Marks)**

PART – B

5 a. Define Dihedral effect and describe on the aspect of Estimation of Airplane dihedral effect. **(10 Marks)**

b. Explain the various methods of Aileron Balancing. **(10 Marks)**

6 a. Define Longitudinal dynamic stability of airplane and plot the types of mode of motion and discuss about phugoid and short period motion. **(10 Marks)**

b. Explain the procedure for the solution of equation of motion of Longitudinal dynamic stick fixed case and obtain the characteristic equation. **(10 Marks)**

7 a. Describe the Dynamic response of Aileron control, considering a one degree of Freedom case. **(10 Marks)**

b. Describe the Dynamic Lateral Stability considering rudder free case. **(10 Marks)**

8 Write short notes on the following :

a. Wing rock. **(05 Marks)**

b. Roll control reversal. **(05 Marks)**

c. Spiral approximation. **(05 Marks)**

d. Dutch roll approximation. **(05 Marks)**

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