

CRASH COURSE

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10AE73

Seventh Semester B.E. Degree Examination, May 2017 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. Explain the terms of equilibrium conditions, static, stability, longitudinal static stability and stability criteria with relevant equations and graphs. (10 Marks)
b. Derive expression for wing contribution $\left(\frac{d_{C_m}}{d_{C_l}}\right)_w$ for the longitudinal static stability of an airplace. (10 Marks)
- 2 a. Derive the expression for elevator effectiveness $C_{m\delta e} = -V_H \eta \tau C_{Ldt}$. (10 Marks)
b. Define : i) Trim condition ii) Static margin
iii) Natural point iv) Elevator power. (10 Marks)
- 3 a. Define stick free neutral point and stick free static margin and obtain relevant expression. (10 Marks)
b. Obtain the expression for $(\delta_e)_{fsc}$ elevator deflection condition for stick free condition. (10 Marks)
- 4 a. Explain the following terms :
i) Adverse yaw ii) Cross wind landings
iii) A symmetric power condition iv) Spin recovery. (10 Marks)
b. Define static directional stability of an airplane and the criteria with the relevant sketches and expressions. (10 Marks)

PART – B

- 5 a. Discuss the effect of wing sweep flaps and power on static a lateral stability. (10 Marks)
b. Define the terms “Dihedral effect” and explain the estimation of some. (10 Marks)
- 6 a. Drive equations of motion of rigid body. (10 Marks)
b. Discuss the derivative due to change in forward speed. (10 Marks)
- 7 a. Discuss the derivative due to change in forward speed. (10 Marks)
b. Discuss the derivative due to the time rate of change of the angle of attack. (10 Marks)
- 8 Write a short notes on the following :
a. Spiral approximation
b. Auto-rotation
c. Dutch roll
d. Routh's criteria. (20 Marks)

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Important Note : On compiling your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
Carefully checking of assessment of paper is recommended.