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No of Printed Pages : 3 **BAS-017**

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination, 2019

BAS-017 : FLIGHT MECHANICS

Time : 3 Hours] **[Maximum Marks: 70**

Note : Attempt **any seven** questions. **Each** question carries **equal** marks. Use of scientific calculator is permitted.

1. Distinguish between Static and Dynamic longitudinal stability. Derive expression for static stability showing the contribution of horizontal tail for stick fixed case. [4+6=10]

2. Define stick fixed and stick free neutral points. How stick fixed and stick free neutral points can be measured experimentally ? [4+6=10]

3. Define Weather cock stability and rudder power and derive their expressions. [4+6=10]

4. Define the following terms : [5×2=10]

   (a) Flutter

   (b) Floating characteristics

(c) Load factor

(d) Trim condition

(e) Elevator effectiveness

5. Derive expression for Elevator angle to trim. Calculate elevator angle to trim using following data : [5+5=10]

C_{L_α} = 5 per rad $C_{m\alpha}$ = -0.8 per rad

C_{m_o} = 0.06 $C_{L\delta e}$ = 0.25

$C_{L_{trim}}$ = 0.5 τ = 0.5

Tail volume coefficient = 0.6

Tail efficiency = 0.9 $C_{L_{\alpha_t}}$ = 4.5 per rad

6. Explain various Longitudinal and Lateral modes with the help of sketches. [10]

7. Write short notes on the following : [2×5=10]

(a) Rudder lock (using sketches)

(b) Adverse yaw and its control

8. Calculate Pitching moment coefficient (C_{mo}) and Pitching moment curve slop (Cm_α) for complete aircraft using

following data : [5+5=10]

$C_{L_{O_w}} = 0.25$ $Cm_{ac_w} = -0.12$

$C_{L_{\alpha_w}} = 5$ per rad $Cm_{o_{fus}} = -0.01$

$S_w = 30m^2$ $C_{m\alpha_{fus}} = 0.11$ per rad

$\bar{C} = 2m$ $S_t = 5m^2$

$X_{cg} = 0.3\bar{c}$ $l_t = 6m$

$X_{ac} = 0.25\bar{c}$ $\eta_t = 0.9$

$l_w = 1.5$ degree λ = Taper ratio = 1

$i_t = -1.5$ deg $C_{L_{\alpha_t}} = 4.5$ per rad

9. (a) Explain various methods of Aerodynamic balancing. [5]

(b) Define Stick fixed and Stick free maneuver points. [5]

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