Code No: R05322101 | **R05** | **Set No. 2**

III B.Tech II Semester Examinations,December 2010
FLIGHT MECHANICS-II
Aeronautical Engineering

Time: 3 hours | Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Draw the maneuver envelope [(V - G) or (V - n) diagram] for a typical fighter aircraft and

    (b) Explain in detail, the features and significance of the V-n diagram for

        i. the aircraft designer
        ii. the pilot. [8+4+4]

2. Explain instability of an airplane in spin. Explain how the design of the airplane can be modified to avoid such an instability. [16]

3. Turbojet or turbofan engines also make a significant contribution to the trim and static stability of an airplane. These effects are divided into two categories. What are they? Explain. [16]

4. Starting with the Y force equation (side force equation), use the small - disturbance theory to determine the linearized force equation. Assume a steady - level flight for the reference flight conditions. [16]

5. An airplane is making a steady turn at constant altitude at an angle of bank of 60 degrees. If the speed of the aircraft is 300 kmph and the acceleration is 2g, what is the yawing velocity of the airplane in degrees per second? [16]

6. (a) What are static stability and dynamic stability?

    (b) With respect to an aero plane, explain the

        i. Longitudinal stability
        ii. Lateral stability
        iii. Directional stability and
        iv. Control. [8+2+2+2+2]

7. The following are the geometric and aerodynamic characteristics of a glider:
   Wing aspect ratio = 8 ; $a_0 = 0.104$;
   $\alpha_{(L = 0)} = $ - 0.12 ;
   Horizontal tail aspect ratio = 4 ; $a_0 = 0.110$;
   Tail volume ratio $V_H = 0.6$; Tail efficiency $\eta_t = 0.9$;
   Rate of change of downwash at tail $d\varepsilon / d\alpha = 0.5$;
   Aerodynamic centre of wing at 0.24 c ; $(dC_m / dC_L)_{Fus} = 0.08$;
   Elevator area ratio $S_e / S_t = 0.35$; Floating tendency, $C_{h,\alpha} = $ - 0.003
   Restoring tendency $C_{h,\delta} = $ - 0.0055 ; Residual hinge moment $C_{h,0} = 0$
   Calculate the stick - free neutral point N_0'. [16]

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Set No. 2

8. The estimation of a flight vehicle's stability and control characteristics is commonly performed via two sets of parameters. What are they? Explain. [16]

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Code No: R05322101 | R05 | | Set No. 4 |

III B.Tech II Semester Examinations,December 2010
FLIGHT MECHANICS-II
Aeronautical Engineering

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Turbojet or turbofan engines also make a significant contribution to the trim and static stability of an airplane. These effects are divided into two categories. What are they? Explain. [16]

2. The following are the geometric and aerodynamic characteristics of a glider:
   Wing aspect ratio = 8 ; $a_0 = 0.104$;
   $\alpha_{(L=0)}$ = - 0.12 ;
   Horizontal tail aspect ratio = 4 ; $a_0 = 0.110$;
   Tail volume ratio $V_H = 0.6$;   Tail efficiency $\eta_t = 0.9$;
   Rate of change of downwash at tail $d\varepsilon / d\alpha = 0.5$;
   Aerodynamic centre of wing at 0.24 c ; $(dC_m / dC_L)_{Fus} = 0.08$;
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   Calculate the stick - free neutral point N_0'. [16]

3. The estimation of a flight vehicle's stability and control characteristics is commonly performed via two sets of parameters. What are they? Explain. [16]

4. An airplane is making a steady turn at constant altitude at an angle of bank of 60 degrees. If the speed of the aircraft is 300 kmph and the acceleration is 2g, what is the yawing velocity of the airplane in degrees per second? [16]

5. Starting with the Y force equation (side force equation), use the small - disturbance theory to determine the linearized force equation. Assume a steady - level flight for the reference flight conditions. [16]

6. Explain instability of an airplane in spin. Explain how the design of the airplane can be modified to avoid such an instability. [16]

7. (a) What are static stability and dynamic stability?
   (b) With respect to an aero plane, explain the
       i. Longitudinal stability
       ii. Lateral stability
       iii. Directional stability and
       iv. Control. [8+2+2+2+2]

8. (a) Draw the maneuver envelope [(V - G) or (V - n) diagram] for a typical fighter aircraft and

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(b) Explain in detail, the features and significance of the V-n diagram for

    i. the aircraft designer

    ii. the pilot.   [8+4+4]

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Code No: R05322101 $\boxed{\textbf{R05}}$ $\boxed{\textbf{Set No. 1}}$

III B.Tech II Semester Examinations,December 2010
FLIGHT MECHANICS-II
Aeronautical Engineering

Time: 3 hours Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
$\star\star\star\star\star$

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 Restoring tendency $C_{h, \delta}$ = - 0.0055 ; Residual hinge moment $C_{h, 0} = 0$
 Calculate the stick - free neutral point N'_0. [16]

5. An airplane is making a steady turn at constant altitude at an angle of bank of 60 degrees. If the speed of the aircraft is 300 kmph and the acceleration is 2g, what is the yawing velocity of the airplane in degrees per second? [16]

6. (a) What are static stability and dynamic stability?

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 i. Longitudinal stability
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8. Turbojet or turbofan engines also make a significant contribution to the trim and static stability of an airplane. These effects are divided into two categories. What are they? Explain. [16]

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III B.Tech II Semester Examinations,December 2010
FLIGHT MECHANICS-II
Aeronautical Engineering

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Answer any FIVE Questions
All Questions carry equal marks
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