CBCS SCHEME

USN | | | | | | | | | | |

18AS56

Fifth Semester B.E. Degree Examination, July/August 2021
Flight Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Calculate the standard atmosphere of T, P and ρ at a geo-potential altitude of 14 km. **(10 Marks)**

b. With a neat sketch, explain in the plane of symmetry the forces and moments acting on aircraft. **(10 Marks)**

2 a. Define neutral point. Derive stick-fixed control neutral point in static longitudinal stability. **(10 Marks)**

b. With appropriate equations, explain power effects on equilibrium and stability equations of aircraft. **(10 Marks)**

3 a. Explain control surface floating characteristics and aerodynamic balance. **(08 Marks)**

b. Estimate hinge moment parameters. **(12 Marks)**

4 a. Derive stick-free neutral point. **(12 Marks)**

b. Elaborate on restriction on aft c.g. point. **(08 Marks)**

5 a. Define static directional stability and derive propeller and wing contribution for directional stability. **(08 Marks)**

b. Write short note on following terms:
(i) Dorsal fin (ii) Rudder lock
(iii) Weather cocking effect (iv) Adverse yaw effects. **(12 Marks)**

6 a. Define dihedral effect and explain the effect of wing sweep, flaps and power on Dihedral effect. **(08 Marks)**

b. Elaborate on following terms:
(i) Aileron control forces
(ii) Aileron reversal
(iii) Coupling between rolling and yawing moments. **(12 Marks)**

7 a. Derive the rigid body equations of motions using Newton's second law. **(10 Marks)**

b. Elucidate on Small disturbance theory and represent aerodynamic force and moment. **(10 Marks)**

8 a. With neat sketch of mechanism for aerodynamic force due to pitch rate, explain derivatives due to the pitching velocities. **(10 Marks)**

b. Mention derivatives due to rolling rate and yawing rate. **(10 Marks)**

9 a. What are types of modes of motion in dynamic stability? Explain them with neat sketch. **(12 Marks)**

b. Define Routh's criterion for stability of aircraft and explain its significance. **(08 Marks)**

10 a. Define dynamic directional stability and lateral stability and explain with neat graphs response to aileron step function. **(10 Marks)**

b. Elaborate on the following terms:
(i) Dutch roll and spiral instability (ii) Auto rotation and spin **(10 Marks)**

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