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21AE/AS54

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Aircraft Performance and Stability

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Derive the equation of motion for steady un-accelerated flight.   (10 Marks)

   b. What is power available and power required curves? Derive the condition for minimum power required.   (10 Marks)

OR

2 a. Derive the expression for rate of climb of an aircraft with analytical approach.   (10 Marks)

   b. With neat diagram illustrate absolute and service ceilings.   (10 Marks)

Module-2

3 a. Write short notes on fundamental parameters of airplane performance parameters. (10 Marks)

   b. Derive Aerodynamic relations associated with $\dfrac{C_L}{C_D}$, $\dfrac{C_L^{\frac{3}{2}}}{C_D}$.   (10 Marks)

OR

4 a. Derive Brequet Range equation for jet propelled aircraft.   (10 Marks)

   b. Write short notes on effect of Head wind and Tail wind.   (10 Marks)

Module-3

5 a. Derive an equation for Ground Roll distance during takeoff.   (10 Marks)

   b. Derive an expression for approach distance during landing.   (10 Marks)

OR

6 a. Derive the equation for minimum turn radius for maneuvering of an aircraft.   (10 Marks)

   b. Explain V-n diagram with a neat sketch.   (10 Marks)

Module-4

7 a. Explain static stability with Ball and Bowl concept and also its stability criteria. (10 Marks)

   b. How the wings are contributed to maintain the stability of an aircraft and obtain an expression.   (10 Marks)

OR

8 a. Explain trim condition and obtain an expression for stick fixed neutral point. **(10 Marks)**

   b. Explain the elevator control power required for landing. **(10 Marks)**

Module-5

9 a. Explain in detail about control surface floating characteristics and also the aerodynamic balancing methods. **(10 Marks)**

   b. How do you estimate the Hinge moment parameters in static longitudinal stability. **(10 Marks)**

OR

10 a. Write an expression for rudder control effectiveness and also mention the rudder requirements. **(10 Marks)**

    b. Write a detailed note on Rudder lock, Dorsal Fin, Weather cocking effect. **(10 Marks)**

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