19AST302 - Flight Dynamics

QUESTION BANK

1. Why the Adverse Yaw happening in airplane?
2. How the Rudder lock occurs in aircraft.
3. List the difference between phugoid motion and short period motion.
4. Show the stability quartic equation for aircraft in dynamics condition?
5. Tell about Spiral divergence of an aircraft.
6. What is meant by aileron reversal?
7. Recall skid, slip and coordinate turn in airplane lateral stability.
8. Outline how the Rudder lock occurs in airplane.
9. How does Porpoising oscillation occurs in Airplane?
10. Outline the Spiral divergence in Airplane.
11. What is the dihedral effect, and why is it important for aircraft stability?
12. Define lateral control and its significance in aircraft maneuvering.
13. Explain aileron power and how it affects an aircraft's roll control.
14. What causes coupling between rolling moment and yawing moment in an aircraft?
15. Describe adverse yaw and how it impacts aircraft control.
16. What is aileron reversal, and under what conditions might it occur?
17. Define static directional stability and its role in maintaining an aircraft's heading.
18. Explain the weather cocking effect and how it influences aircraft stability.
19. What are the primary rudder requirements for maintaining directional control?
20. Describe the critical factors to consider in one-engine inoperative conditions.
21. Explain the concept of static free directional stability.
22. What is rudder lock, and how can it be prevented?
23. How does the dihedral angle contribute to roll stability?
24. Why is lateral control essential during turns in flight?
25. Discuss how adverse yaw is managed using control surfaces.
26. What role does the rudder play in counteracting adverse yaw?
27. How can aileron power be increased for better roll response?
28. Explain the importance of static directional stability in crosswind conditions.
29. Describe how the rudder helps during an engine-out situation.
30. What are the primary functions of the rudder in maintaining flight path stability?

    i) Illustrate aerodynamic balancing of control surface.
    ii) Examine the effect of dihedral on static lateral stability with neat sketch.
31. Evaluate the aileron power by using stipe theory and what are the factors affecting aileron control power?
32. Construct the dynamics of a spiral motion in the context of aircraft stability. What factors influence a spiral, and how can it be controlled?

33. Inspect the concept of a spin in dynamic stability. What are the characteristics of a spin, and what factors influence an aircraft entering into a spin?
34. Formulate the case study, potential aerodynamic modifications or system enhancements that could be implemented to improve the overall safety and handling characteristics of an airplane during one engine failure.
35. Imagine a case study that describe the spin's characteristics and discuss the factors that make an aircraft enter into a spin. Provide real-world examples to show why understanding spins is important for aviation safety.
36. Relate the effects of dihedral on static lateral stability with a sketch.
37. Determine the contribution of vertical tail in lateral static stability.
38. Evaluate the equations of motion of an airplane constrained to the plane of symmetry at constant speed.
39. Explain the short notes on the following with neat sketch:
    - Dutch roll
    - Spiral instability
    - Autorotation and Spin.
40. Explore real-world examples or incidents where the weather cocking effect (WCE) played a significant role. How did these instances influence aircraft performance and safety?
41. Imagine a case study where one engine inoperative (OEI) conditions, what are the primary challenges and considerations when an aircraft experiences engine failure, especially at cruising altitude?
42. Explain the concept of dynamic longitudinal stability and discuss its significance in aircraft performance and control.
43. Describe the different modes of stability in an aircraft, specifically focusing on short-period and phugoid modes in the context of dynamic longitudinal stability.
44. Discuss the effect of freeing the stick on longitudinal stability. How does it impact the pilot's ability to maintain control?
45. Provide a brief description of lateral and directional stability, emphasizing their roles in maintaining an aircraft’s heading and alignment during flight.
46. Define dynamic stability and differentiate between positive, neutral, and negative dynamic stability in aircraft. Provide examples for each.
47. Explain spiral divergence and Dutch roll as two distinct dynamic stability issues in aircraft. How do they differ, and what are the corrective measures for each?
48. Describe the Dutch roll phenomenon in aircraft, including the conditions that cause it, its effects on flight stability, and methods to counteract it.
49. Explain auto-rotation and its relevance in the context of aerodynamic stalls. What role does it play in the onset of a spin in aircraft?
50. Discuss the spin of an aircraft, detailing the phases of entry, incipient spin, fully developed spin, and recovery. How does understanding spin behavior contribute to aircraft safety?