Register No: ……

B.E DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

AERONAUTICAL ENGINEERING

U07AR604: Aircraft Stability and Control

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. If an aircraft is statically stable, it may be dynamically

a) stable b) unstable c) neutral d) stable or unstable

2. Static longitudinal stability is sometimes known as

a) pitch stabilty b) yaw stability c) roll stability d) stability

3. Horn Balance is a type of

a) Mass balance b) weight balance

c) Aerodynamic balance d) both wt and mass balance

4. If C.P is ahead of C.G is known as

a) Tail heavy b) Belly heavy c) Wing heavy d) Nose heavy

5. The principal surface contribution to the lateral stability of an aircraft is

a) Wing b) Stabilizer c) Tail plane d) Fins

6. The term PB/2V is related to

a) Rolling b) aileron power c) Yawing d) pitching

7. Weather cock stability is known as

a) Dynamic b) Divergence stability c) Static divergence stability d) static stability

8. Critical speed of rudder stability deflection is related to

a) Yaw b) Roll c) pitch d) Engine induced yaw

9. Long period oscillation means the time taken for the oscillation is

a) >10 sec b) < 10 sec c) > 5sec d) < 5 sec

10. The mode which is a coupling between rolling and yawing is called

a) Roll b) Dutch roll c) Spin d) Yaw

PART B (10 x 2 = 20 Marks)

11. Define the term stability and control.

12. What you mean by degrees of freedom.

13 State the purpose of primary control surfaces?

14. Draw the graph for Cmcg Vs CL and write its significance.

15. Differentiate stick free condition and stick fixed condition.

16. What is Aerodynamic balancing?

17. What is rudder lock?

18. What is aileron reversal?

19. Differentiate Weather Cock stability and Spiral Instability.

20. Define phugoid motion.

PART C (5 x 14 = 70 Marks)

21. a) Explain briefly the types of stability with neat diagram?

(OR)

b) Short notes on:

(i) Explain the criteria for longitudinal static stability.

(ii) Inherently stable airplane.

22. a) Briefly explain the contribution of wing and tail for longitudinal static stability with appropriate diagrams.

(OR)

b) Derive an expression for the wing contribution to the pitching moment of an aircraft about centre of gravity.

23. a) (i) Explain briefly aileron power

(ii) How does the elevator deflection change C_{MCG}?

(OR)

b) What is Dihedral effect? Explain the problem of too much Dihedral effect with neat sketch.

24. a) Derive the expression for Critical Velocity for Propeller engine and Jet Engine.

(OR)

b) A typical longitudinal stability quadratic equation for an aircraft having a mass of 20,000kg and 'a' wing area of $50m^2$ flying at 240m/sec at an altitude where the relative density is 0.5 is $\lambda^4+4.5\lambda^3+8.3\lambda^2+0.5\lambda+0.06=0$. Find the period and amplitude for a given longitudinal stability quadratic equations.

25. a) Write short notes on:

(a) Auto Rotation (b) Dutch Roll

(OR)

b) Explain the Dynamic Lateral and Direction Stability.

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