Register Number: ……..

B.E DEGREE EXAMINATIONS: JUNE/JULY 2013

Seventh Semester

AERONAUTICAL ENGINEERING

AER141: Vibrations And Aero Elasticity

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Energy method is only valid for
   a) SDOF b) MDOF
   c) Both a and b d) None of the above
2. The natural frequency of any system depends on
   a) Mass b) velocity
   c) Stiffness d) Both a and c
3. At critical damping oscillatory, non-oscillatory and radial motions should be
   a) Uniform b) Zero
   c) Non uniform d) Equal
4. Harmonic excitation may be in the form of
   a) Force b) displacement
   c) Both a and b c) moment
5. In multiple degrees of freedom systems each natural frequency has a displacement referred to as
   a) Normal mode b) Natural mode
   c) Sub critical mode c) Critical mode
6. Projection on a straight line of a point that is moving on a circle at constant speed is known as
   a) Harmonic motion b) Oscillatory motion
   c) Transverse motion d) Non uniform motion
7. The main advantage of approximation methods is
   a) Elimination of ordinary differential equation b) Elimination of constant coefficients
   c) Elimination of partial differential equation d) Elimination of functions
8. Torsional vibrations may result in shaft due to
   a) Inertia force b) Impulsive load and shock load
   c) torque d) All of the above

9. Divergence occur when lifting surface deflects under

a) Aerodynamic load b) Impulsive load

c) Shock load d) All of the above

10. ---------- occur due to positive feedback between the structure's natural vibration and aerodynamic forces.

a) Buffeting b) Divergence

c) Control surface reversal d) Flutter

PART B (10 x 2 = 20 Marks)

11. What is simple harmonic motion? Explain.
12. State D 'Alembert's principle.
13. Define phase distortion.
14. Define critical damping.
15. What are static and dynamic couplings? Explain.
16. What is vibration isolation? Explain .
17. What is bounded input? bounded output stable?
18. Define virtual mass effect.
19. Explain the effect of mass balance on flutter.
20. Define "Strouhal Number

PART C (5 x 14 = 70 Marks)

21. a) State the use of Newton's law of motion? And explain the D' Alembert's Principle.

(OR)

b) Derive the equation of motion for the spring-mass system by using energy method.

22. a) In a damped vibration system derive an expression for the logarithmic decrement in terms of system parameters.

(OR)

b) i) Briefly explain the different vibration measuring instruments. (4)

ii) A spring mass system of 2 kg mass, 200 N/m spring constant, 50 N/m damping constant is subjected to forcing function F = 0.5sin50t. Find the amplitude of vibration. (10)

23. a) Briefly explain the determination of natural frequency by using Raleigh method.

(OR)

b) What is called Euler-Bernouli beam? Briefly explain the lateral vibrations in the beam

24. a) Derive an expression for the divergence speed of a 2D wing

(OR)

b) Derive expression for the control surface reversal speed

25. a) Explain Approach to static aero elastic analysis of a combat aircraft

(OR)

b) Explain Flutter of hybrid laminated curved panels in supersonic flow

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