

SRINIVASAN ENGINEERING COLLEGE

Department of aeronautical engineering

AE-1006 VIBRATION AND AEROELASTICITY

QUESTION BANK

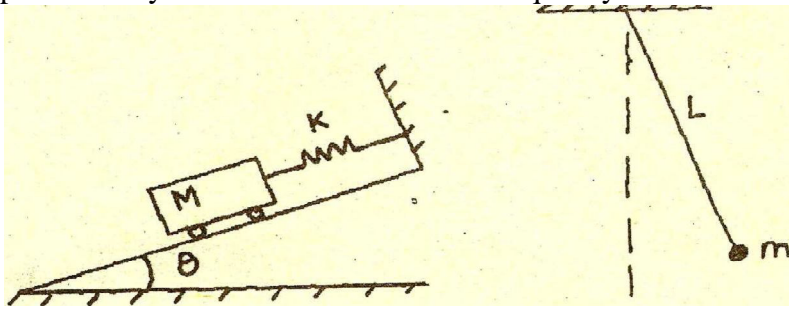
PART A

1. What is free body diagram?
2. State D'Alembert's principle.
3. What are the causes and effect of vibration?
4. Distinguish between periodic and simple harmonic motion
5. Define the coefficient of viscous damping?
6. List the main causes of vibration and the methods to reduce them
7. Define frequency, cycle, period and free vibration.
8. Define continuous system
9. Define discrete system.
10. What is natural frequency?
11. Define degree of freedom.
12. Define the concept resonance.
13. What is damping and types of damping?
14. What are the different types of vibrations?
15. State different method of finding natural frequency of a system.
16. When is vibratory system said to be critically damped?
17. Different types of vibration measuring instruments
18. What is meant by free vibration and forced vibration?
19. What do understand by transient vibration and steady state response?
20. Define resonance.
21. Explain longitudinal, transverse and torsional vibration with the sketch?
22. What is meant by degrees of freedom in a vibrating system?
23. What is the natural frequency of simple spring mass system?
24. What are the different types of damping?

25. Sketch the Time Vs Displacement for under-damped and over-damped systems.
26. What is meant by critical damping?
27. Differentiate between transverse and torsional vibrations.
28. Define damping ratio or damping factor.
29. Define logarithmic decrement.
30. Give equation for damping factor and damped frequency?
31. What are the vibration mode shapes of a structure?
32. What are the “normal modes” of vibration
33. What is meant by harmonic forcing?
34. What is the relationship between frequencies of undamped and damped vibration?
35. Define eigen function, eigen vector, eigen value?
36. What is meant by dynamic magnifier or magnification factor?
37. Explain coordinate coupling in a multi degree of freedom system?
38. Define transmissibility.
39. Define the stiffness influence coefficient?
40. Define transmissibility ratio or isolation factor.
41. What is vibration isolation?
42. What do you understand by Rayleigh’s stationary principle?
43. List the different aero elasticity problem and methods to prevent

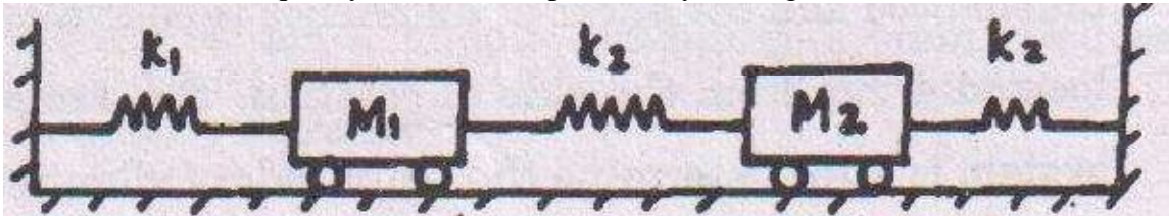
PART B

1. Derive expression and obtain the natural frequency of vibration of a spring mass system in vertical position.
2. Derive expression and obtain the natural frequency of vibration of a spring mass system in horizontal position.
3. Obtain the expressions for the equivalent spring constants of spring when they are set in parallel and in series.
4. Using the energy method, obtain the equation governing free vibration for a simple pendulum system. Deduce the natural frequency of the same.

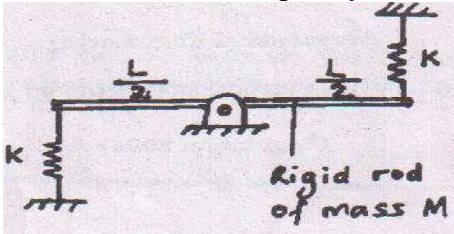


5. Consider a bar undergoing free axial vibrations. Derive and obtain the governing differential equation.
6. Derive the expression for torsional vibration.
7. Derive an expression for the natural frequency of the free longitudinal vibration by (i) Equilibrium method (ii) Energy method (iii) Rayleigh's method
8. Determine equation of motion when a liquid column vibrating in a 'U' tube by (i) Newton's method (ii) Energy method and hence find its natural frequency.
9. Derive and obtain the governing differential equation for a beam undergoing free bending vibration. Solve for natural frequencies and mode shape of a simply supported beam.
10. Explain the application of Lagrange's equation in vibration.
11. State Hamilton principle, obtain the governing equation.
12. Describe an approximate method for determining the frequency and mode shapes of a simply supported beam of arbitrary mass distribution undergoing flexural vibrations.

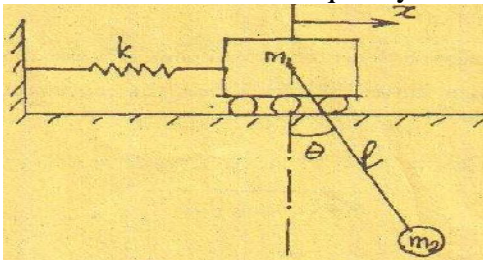
13. Obtain the natural frequency and mode shape of the system fig.



14. Obtain the natural frequency of the system fig.



15. Determine the natural frequency and amplitude ratios of the fig.



16. Deduce the expression for the free longitudinal vibration in terms of spring stiffness, its inertia effect and suspended mass.

17. Explain the different types of vibration measuring instruments?

18. Explain the working principle of Frahm's reed tachometer.

19. Discuss the design of a dynamic vibration absorber unit.

20. Write short notes on following

- (i) loss of aileron control
- (ii) divergence of a 2d wing
- (iii) stall flutter

21. Consider a 2-d wing with aileron attached. Derive and obtain an expression for the aileron control reversal speed.

22. Distinguish resonance and flutter.

23. Explain Collar's triangle and different aeroelastic phenomena

24. Briefly discuss the different methods of flutter prevention,