Total No. of Questions : 8] *[Total No. of Printed Pages : 4*

Roll No .....

AU/ME-703 (GS)

B.E. VII Semester

Examination, December 2017

Grading System (GS)

Mechanical Vibration & Noise Engineering

Time : Three Hours

Maximum Marks : 70

Note: i) Answer any five questions. All questions carry equal marks.

ii) All parts of each question are to be attempted at one place. Assume data suitably if missing.

iii) Draw neat and clean sketches/diagrams/figures wherever necessary.

1. a) What are the three elementary parts of a vibrating system? Define the number of degrees of freedom of a vibrating system.

   b) What are beats? How do you connect several springs to increase the overall stiffness?

2. a) What is the difference between deterministic and random vibration? Give two practical examples of each. What are the common types of damping?

   b) Determine the equivalent spring constant of the system shown in Figure-1.

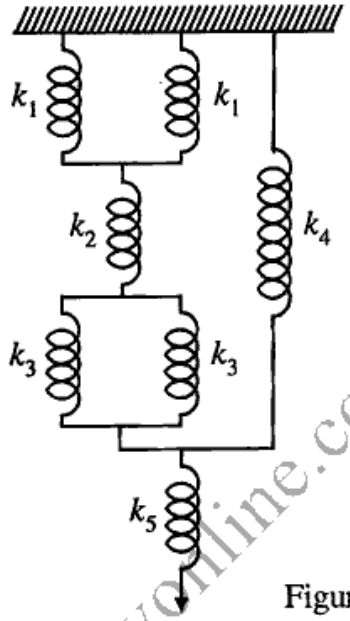

Figure-1

3. a) What is the reason for studying the vibration of a single-degree-of-freedom system? What is critical damping and what is its importance?

   b) A spring-mass system has a natural frequency of 10Hz. When the spring constant is reduced by 800N/m, the frequency is altered by 45 percent. Find the mass and spring constant of the original system.

4. a) If a vehicle vibrates badly while moving on a uniformly bumpy road, will a change in the speed improve the condition? Is dry friction effective in limiting the resonant amplitude?

b) A mass m is suspended from a spring of stiffness 4000N/m and is subjected to a harmonic force having an amplitude of 100N and a frequency of 5Hz. The amplitude of the forced motion of the mass is observed to be 20mm. Find the value of m.

5. a) Why are the mass, damping and stiffness matrices symmetrical? What is a degenerate system? Give two examples of physical systems that are degenerate.

b) Write the equations of motion of a multi-degree-of-freedom system in matrix form using:

i) The flexibility matrix

ii) The stiffness matrix

6. a) State Lagrange's equations. What is a mode shape? How is it computed?

b) What is the expansion theorem? What is its importance? Explain the modal analysis procedure.

7. Derive the flexibility and stiffness matrices of the spring-mass system shown in Figure-2 assuming that all the contacting surfaces are frictionless.

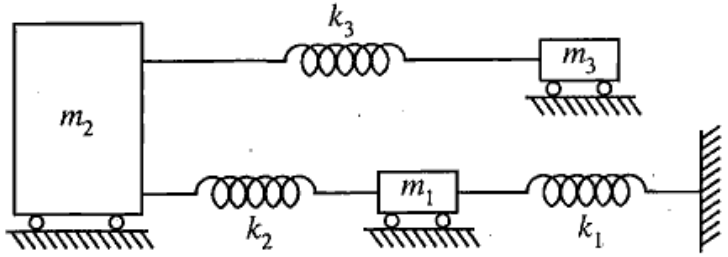

Figure-2

8. Write short technical notes on following (Any two):

a) Industrial Noise Control

b) Critical speed of a shaft carrying multiple discs

c) Auditory Effects of Noise

d) Torsion Vibration Absorber

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