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Roll No

MMMD/MMPD - 104

M.E./M.Tech., I Semester

Examination, December 2015

Theory of Vibration

Time : Three Hours

Maximum Marks : 70

- Note : i) Attempt any five questions out of eight questions given.
 ii) All questions carry equal marks.
 iii) Assume suitable data, if necessary.
 iv) Draw neat diagrams in support of your answers.

- What are the three elementary parts of a vibrating system? Give two examples each of the bad and the good effects of vibration.
 - In vibration analysis, can damping always be disregarded? What methods are available for solving the governing equations of a vibration problem?
- How can we obtain the frequency, phase, and amplitude of a harmonic motion from the corresponding rotating vector?
 - Define spring stiffness and damping constant. What are the common types of damping?
- A spring-mass system is subjected to a harmonic force whose frequency is close to the natural frequency of the system. If the forcing frequency is 39.8 Hz and the natural frequency is 40.0 Hz, determine the period of beating.
- Define these terms: mass coupling, velocity coupling, and elastic coupling.
 - Find the natural frequencies and mode shapes of a spring-mass system, shown in Fig. 1, which is constrained to move in the vertical direction only. Take $n=1$.

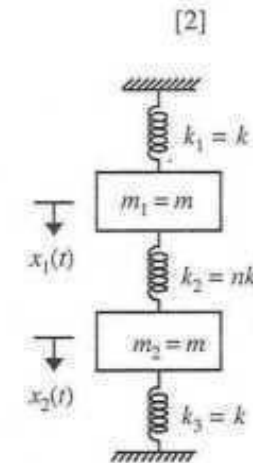


Fig. 1: Question 4 b): Two-degree of freedom system.

- Define the flexibility and stiffness influence coefficients. What is the relation between them?
 - What is a generalized mass matrix?
- Derive the equations of motion, using Newton's second law of motion, for the system shown in Fig.2.

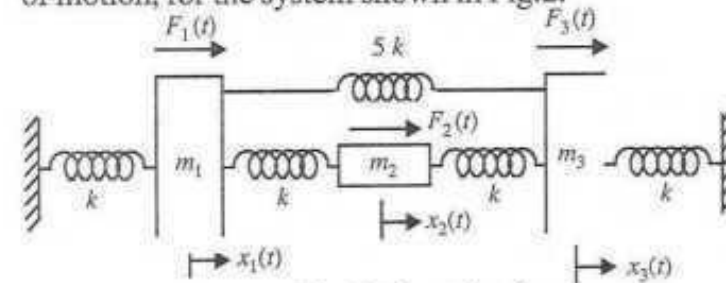


Fig.2: Question 6.

- Define a tridiagonal matrix. What is the basic assumption of the Wilson method?
 - Describe the procedure of the finite difference method.
- Write short note on following (any two):
 - Perturbation method of nonlinear vibration.
 - Jump phenomena.
 - Self-excited vibrations for dry friction
 - Stodola's method.