Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No

MVSE-201

M.E./M.Tech. II Semester

Examination, May 2018

Structural Dynamics

Time : Three Hours

Maximum Marks : 70

Note: i) Answer any five questions out of eight.
ii) All questions carry equal marks.
iii) Missing data, if any, may be suitably assumed.

1. a) Explain D'Alembert's principle and its applications.
   b) A body of mass 8kg is supported on a spring of stiffness 2340N/m and has a dashpot connected to it having damping coefficient 1.96N-s/m. In what ratio will the amplitude of vibration on reduced after 5 cycles of vibration?
2. a) Explain 'Logarithmic decrement' and Duhamel's integral for undamped system.
   b) Write note on viscous dampers.
3. A single degree of system consists of a mass 20kg, spring of stiffness 2200N/m and a dashpot with a damping coefficient of 60N-s/m is subjected to a harmonic excitation of F=200sin 5t Newton's. Determine the steady state of response and write the solution of equation of motion.
4. Use the Laplace Transform method to determine the response of a damped SDOF system with natural frequency ω_n, damping factor ξ and mass m, initially at rest in equilibrium and subject to step excitation force $F(t)=F_0$.
5. A two degree of freedom system is shown in Fig 1.
   a) Write down the governing equations of motion in matrix form in terms of k_1, k_2, k_3, m_1 and m_2.
   b) If $m_1=2m$, $m_2=m$, $k_1=k$, $k_2=2k$, $k_3=3k$, find the natural frequencies for the system in terms of k and m.

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c) Find the mode shapes for the natural frequencies.

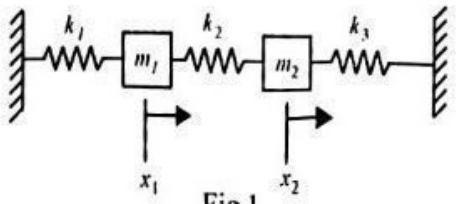

Fig 1

6. a) State and explain the orthogonality principle of normal modes.
   b) Write a note on the following:
      i) Method of matrix iteration
      ii) Critical damping
7. A simple bent having a symmetrical distribution of mass has column of unequal sectional areas. The girder is depressed in such a way as to cause equal displacements of the top of columns. It is suddenly released at t=0.
   Determine the configuration of the possible free vibrations and the displacement at any time t. $E=2\times10^6 kg/cm^2$. The bent is shown in fig 2.

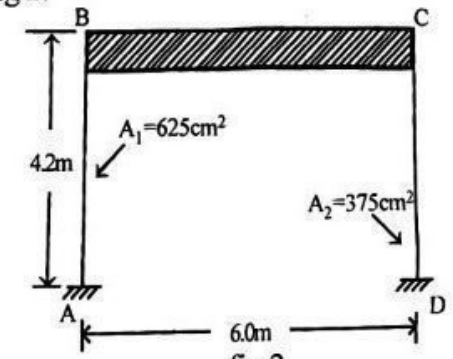

fig 2

8. Explain the Rayleigh's method of estimating fundamental frequency of continuous system and explain modifications made in Rayleigh Ritz approach.

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