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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M. Tech -Civil Engineering (MCAD)

Semester End Examination; Jan/Feb. - 2016

Structural Dynamics – Theory and Computation

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*

UNIT - I

1 a. Derive the differential equation of motion for the free vibration of a spring mass system; obtain the solution of the differential equation. Sketch the motion of the system. 14

b. Find the natural frequency of the system shown in Fig Q. 1(b) Take; m = 20 kg, K = 100 N/m 6

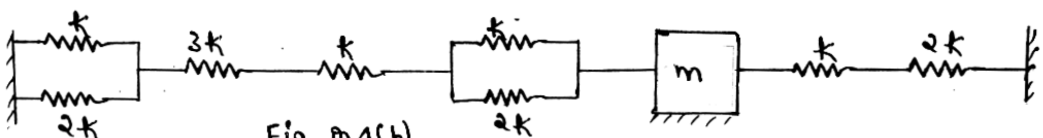

Fig. Q1(b)

2 a. Derive the expression for logarithmic decrement of a SDOF damped system. 8

b. For the system shown in Fig. Q.2 (b), write the equation of the motion and determine the critical damping co-efficient. 12

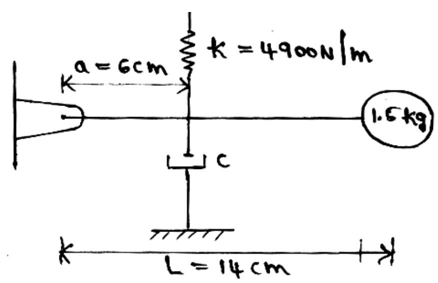

Fig. Q2(b)

UNIT - II

3 a. A spring mass dashpot-system is subjected to harmonic force $F_0 \sin wt$. Derive the expression for dynamic magnification factor. 12

b. A vibrating system having mass 1 kg is suspended by a spring of stiffness 1000 N/m and it is put to harmonic excitation of 10 N. Assume various damping, determine the following : 8

i) Resonant frequency ii) Amplitude of resonance

iii) Frequency corresponding to the peak amplitude iv) Damped frequency

Take; C = 40 N-s/m.

4 a. Derive the expression for Duhamel’s integral for the response due to general dynamic loading. 8

b. Derive the expression for dynamic amplitude for a rotating and reciprocating unbalanced mass subjected to forced vibration. 8

c. For what value of ‘m’ will resonance occur for the system shown in Fig Q4(c) 4

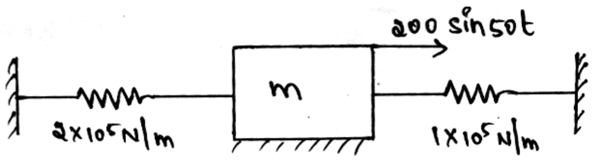

Fig. Q4 (c)

UNIT - III

5. For the system shown in Fig. Q. 5. Obtain natural frequencies and the corresponding mode shapes. 20

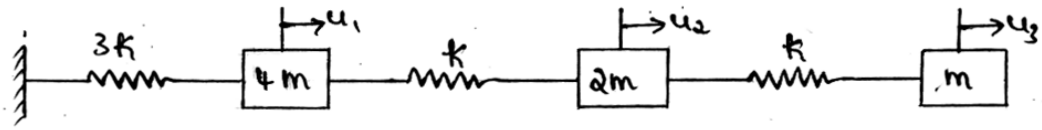

Fig. Q5

6. Determine the response for MDOF system shown in Fig. Q 6. 20

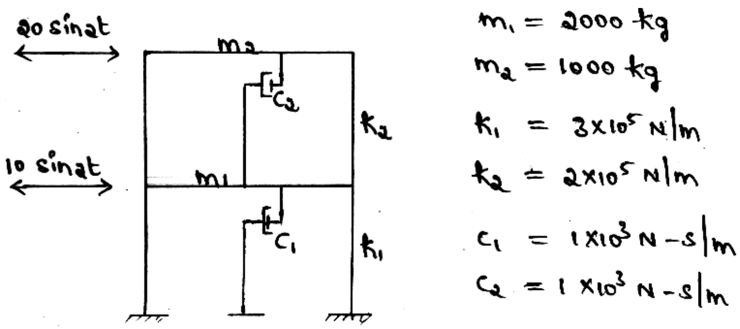

Fig. Q6

UNIT - IV

7. Determine the expressions for the natural frequencies and mode shapes for a uniform cantilever bar in axial vibration. 20

8. Obtain the general expression for the natural frequencies of free flexural vibration of a simply supported beam of length l and uniform cross section. Assume flexural rigidity EI, cross sectional area A and mass density ρ. 20

UNIT - V

9. Using the cubic Hermitian polynomials, determine the stiffness co-efficient k_{ii} for I = 1 to 4 for a two noded Euler-Bernoulli element. 20

10. Write short note on any four 20

    i) Lumped and consistent mass matrix for dynamic analysis of beams

    ii) Orthogonality of normal modes

    iii) D'Alembert's Principle

    iv) Vibration measuring instruments

    v) Force Transmissibility

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