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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 - 2017

Structural Dynamics-Theory and Computations

Time: 3 hrs *Max. Marks: 100*

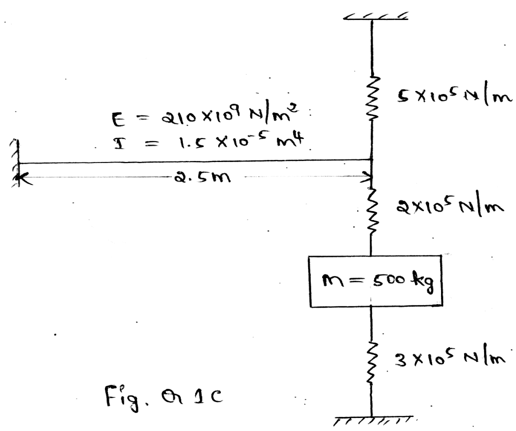
***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Assume missing data, if any.

UNIT - I

1 a. Explain:
i) Dynamic Degree of Freedom ii) D'Alembert's Principle. 6

b. Sketch the simple SDOF mathematical model and explain the components of it. 6

c. Find the natural frequency of the system shown in Fig. Q1c. 8



2 a. What is damping? Explain any one method of evaluating damping. 10

b. Write the DE of motion and determine the initial damping coefficient for the system shown in Fig.Q.2b. 10

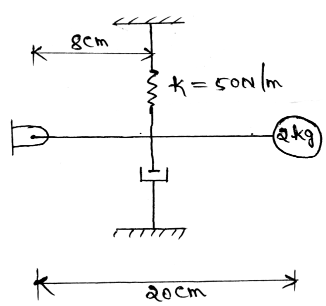


Fig. Q 2b

UNIT - II

3 a. A spring mass dashpot system is subjected to harmonic force $F_0 \sin \overline{w}t$. Derive the expression for magnification factor. 14

b. Derive the expression for Duhamel's Integral for the response due to general dynamic loading. 6

4 a. Derive the expression for the steady state response of a spring mass dashpot system, with main mass in an eccentric mass *m* and eccentricity *e*, rotation of machine *w* rad/sec. 10

b. A weight attached to a spring of stiffness 530 N/m and undergoes viscous damping and the weight was displaced and released as shown in Fig. Q.4b. The period of vibration was found to be 1.8 seconds. The ratio of consecutive amplitudes was found to be 4.2/1. Determine the amplitude and phase angle when a force of 200cos*wt* acts on the system. 10

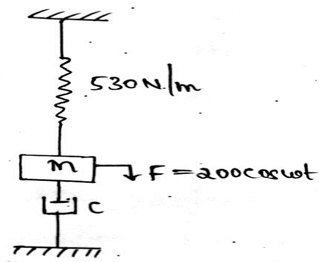


Fig. Q4b

UNIT - III

5. Determine the natural frequencies and mode shapes of the system shown in Fig. Q5. Sketch the mode shapes also. 20

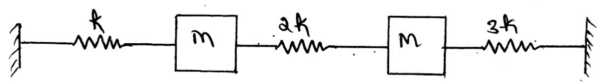


Fig. Q5

6. Determine the natural frequency and mode shape for the structure shown in Fig. Q6. 20

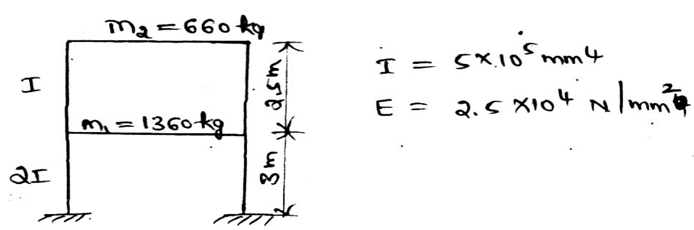


Fig. Q6

UNIT - IV

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

8. For a continuous system subjected to flexure, set-up the differential equation of motion. Also determine the frequency equation of a uniform beam fixed at one end and free at the other end. 20

UNIT - V

9. Using the Cubic Hermition polynomials, determine the stiffness coefficient k_{ii} for i = 1 to 4 for a two noded Euler-Bernoulie element. 20

10. Determine the natural frequency for fixed beam shown in Fig.10. 20
Take EI = 100 N-m^2, ρ = 10.

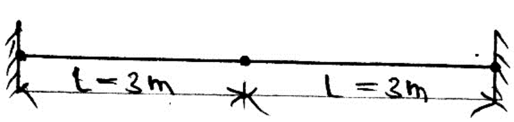


Fig. Q10

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