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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, M. Tech. - Mechanical Engineering (MMDN)

Semester End Examination; June - 2017

Advanced Theory of Vibrations

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 spring mass-damper system is subjected to periodic forcing function shown in Fig.Q.1. Determine the steady state response of the system, assuming m = 0.25 kg, K = 2500 N/m and C =10 N-s/m. 20

2. Using the method of convolution integral, obtain the response equation for an under damped single degree of freedom system subjected to arbitrary excitation *F*(t). 20

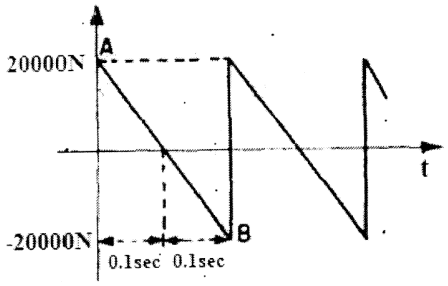

Fig.Q1

UNIT - II

3. Write the mass and stiffness matrix for the system shown in Fig Q.3 and obtain the natural frequencies and mode shapes. 20

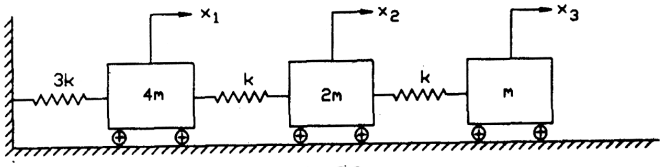

Fig.Q3

4. For the system shown in Fig Q. 4 determine the flexibility matrix and stiffness matrix and show that they are inverse to each other. 20

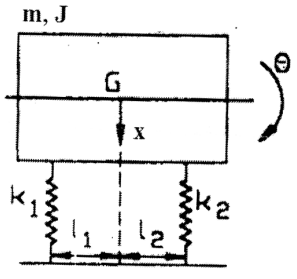

Fig.Q4

Contd….2

UNIT - III

5. Obtain the equation of motion for longitudinal vibrations of uniform bars. 20

6. Derive the expression for motion of torsional vibrations of circular uniform shafts. 20

UNIT - IV

7 a. With the help of necessary figures and equations, explain the difference between working of vibrometer and accelerometer. 12

b. Sketch and explain single reed tachometer. 8

8 a. Sketch and explain the method of measuring velocity of vibration 10

b. A spring-mass system having a static deflection of 10 mm and negligible damping is used as a vibrometer. When mounted on a machine operating at 4000 rpm, the relative amplitude recorded is 1 mm. Find the maximum values of displacement, velocity and acceleration of the machine. 10

UNIT - V

9 a. Obtain the expression for restoring forces of non-linear vibrations of system shown in Fig. Q 9(a). 12

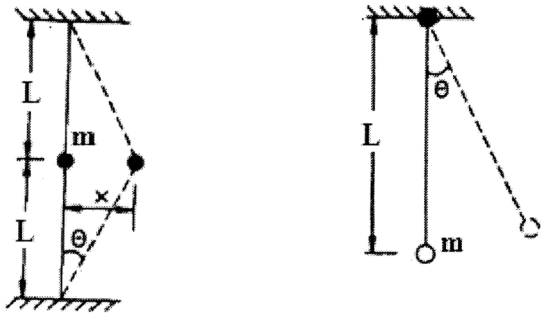

Fig. Q 9(a)

b. Obtain the expression for Phase-plane trajectories of an undamped linear system. 8

10 a. Explain method of isoclines for constructing phase-plane trajectories. 5

b. Obtain the phase-plane trajectory of a linear damped system with natural frequency of 1 rad/sec and damping ratio of 0.5. 15

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