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

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Automobile Engineering

Semester End Examination; June - 2017

Mechanical Vibration

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1 a. Determine the natural frequency of the spring mass system : 12

i) By neglecting the mass of the spring ii) By considering mass of the spring.

b. Find the natural frequency of the system shown in Fig. 1(b). 8

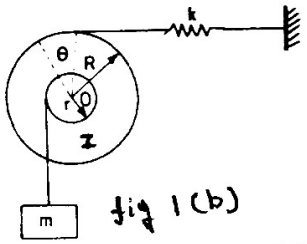

fig 1(b)

2 a. What is logarithmic decrement? Derive expression for logarithmic decrement in terms of damping ratio. 10

b. Derive equation of motion for system shown in Fig. 2 (b) If m = 1.5 kg, k = 4900 N-s/m, a = 6 cm, b = 14 cm. Determine critically damping coefficient. 10

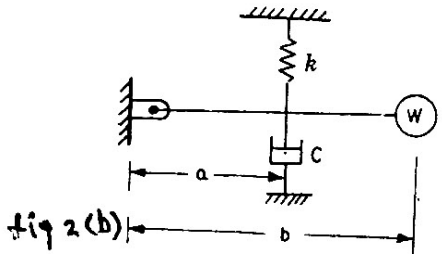

fig 2(b)

UNIT - II

3 a. Derive an expression for magnification factor. 10

b. An electric motor is supported on a spring and a dashpot. The spring has the stiffness 6400 N/m and dashpot offers resistance mass 500 N at 4.0 m/s. The unbalance mass 0.5 kg rotates at 5 cm radius and the total mass at vibratory system is 20 kg. The motor runs at 400 rpm. Determine; 10

i) Damping factor

ii) Amplitude of vibration and phase angle

iii) Resonant speed and Resonant amplitude.

4 a. Define force transmissibility and obtain expression for the same. 10

Contd … 2

b. Fig. 4(b) shows on automobile trailer which moves over the road surface making approximately sinusoidal profile with wave length of 8 m and amplitude of 6 cm. The trailer is pulled on the road surface with a velocity of 60 km/hr. Calculate the critical speed of the trailer, if the vibration amplitude is 1.5 cm for the trailer mass of 50 kg. 10

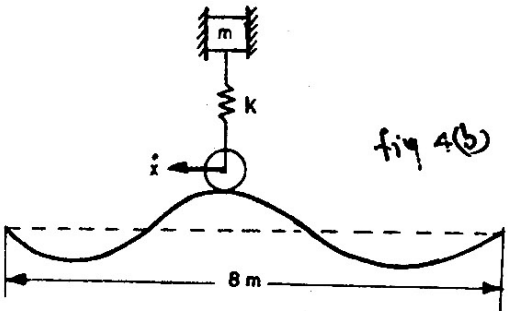

fig 4(b)

UNIT - III

5 a. With a neat sketch, explain seismic instrument. Also discuss principle of vibrometer and accelerometers. 10

b. The static deflection of vibrometer mass is 20 mm. The instrument attached to a machine vibrating with a frequency of 125 cpm records relative velocity amplitude of 0.03 cm, find out for the machine; 10

i) Amplitude of vibration

ii) Maximum velocity of vibration

iii) The Maximum acceleration.

6 a. Discuss critical speeds of shafts. 6

b. The rotor of a turbo super charger weights 70 N and supported between bearings which are 40 cm apart. The bearing can be considered as of shorter width. The C.G of the disk is at a distance of 0.025 cm from the geometrical center. 14

Determine ; i) The critical speed of the disk

ii) The maximum deflection of the shaft at a speed of 300 rpm

iii) The dynamic force transmitted to the bearings. Take E = 2.1x10 N/m^2.

UNIT - IV

7. Determine the natural frequencies, amplitude ratio and mode shape of the system shown in Fig. (7). Take $m_1 = 1.5$ kg , $m_2 = 0.80$ kg, $k_1 = k_2 = 40$ N/m. 20

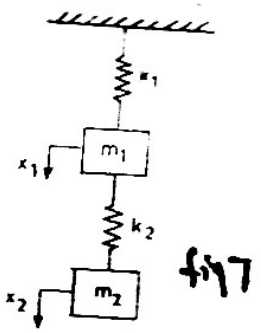

fig 7

8. Determine the natural frequencies, amplitude ratio and mode shape of the system shown in Fig. (8). 20

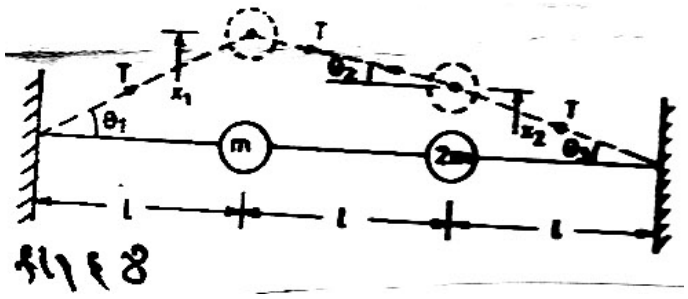

fig 8

UNIT - V

9. Using Holzer's method, determine the natural frequencies of the system shown in Fig. (9). 20

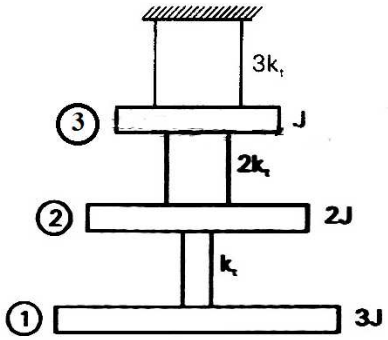

Fig. 9

10 a. For the system shown in Fig.10 (a) find the first natural frequency by Stodala's method. 10

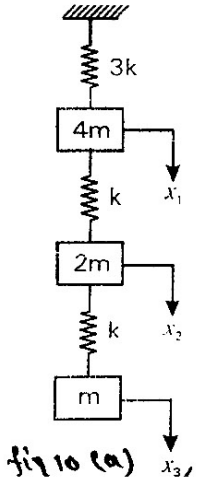

fig 10 (a)

b. Determine the influence coefficients of triple pendulum shown in Fig .10(b). 10

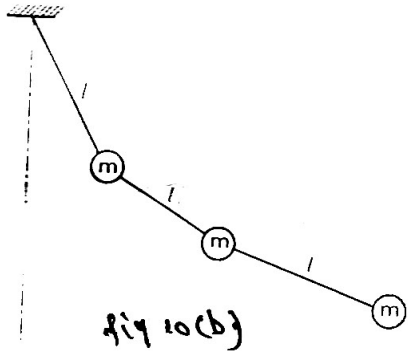

fig 10(b)

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