Total No. of Questions : 8]

SEAT No. :

PE2309

[Total No. of Pages : 3

[6584]-218

B.E. (Mechanical)

DYNAMICS OF MACHINERY

(2019 Pattern) (Semester - VII) (402042)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) For the spring mass system shown in Fig. 1a), If K_1 = 2 N/mm, K_2 = 1.5 N/mm, K_3 = 3 N/mm, K_4 = K_5 = 1.5 N/mm, Determine mass 'm' if the system has a natural frequency of 12 Hz. **[9]**

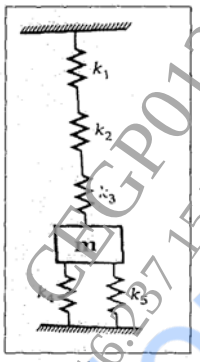

Fig. 1a)

b) Enlist elements of a vibratory system and explain with neat diagram mathematical modeling of a bicycle. **[8]**

OR

Q2) a) In a Single Degree of Freedom vibratory system, a suspended mass of 16 kg makes 30 oscillations in 22 seconds. The amplitude of oscillations decreases to 0.25 of initial value after 5 oscillations. **[9]**
Determine the
i) Stiffness of the spring
ii) Logarithmic decrement
iii) Damping factor
iv) Damping Coefficient

b) Discuss importance of damping in vibratory system. Explain various categories of damping based on damping ratio (ξ). **[8]**

P.T.O.

Q3) a) An electric motor running at 500 rpm is supported on a spring and a dashpot. The spring has the stiffness of 6400 N/m and dashpot offers a resistance of 400 N at 4.0 m/sec. The unbalanced mass of 0.6 kg rotates at 5 cm radius and the total mass of vibratory body is 16 kg. **[10]**

Calculate:

i) Damping factor

ii) Amplitude of vibration and phase angle

iii) Resonant speed and resonant amplitude

iv) Force exerted by spring and dashpot on motor

v) Resultant force

b) Explain in detail with neat sketch forced vibration due to rotating unbalance. **[8]**

OR

Q4) a) A machine having mass of 200 kg is mounted on spring and damper. The total stiffness of spring is 7.84×10^5 N/m while damping ratio of damper is 0.15. A vertical harmonic force F = 392sin (314.15t) N acts on the machine. For the steady state vibrations of the system, **[10]**

Calculate,

i) amplitude of vibration

ii) the transmissibility

iii) transmitted Force

iv) phase difference between transmitted force and excited force

b) Explain quality factor and half power bandwidth. **[8]**

Q5) a) For the vibratory system shown in Fig. 5 a), determine two natural frequencies and corresponding modes of vibration. **[10]**

Given, $m_1 = 2$ kg, $m_2 = 3$ kg

$K_1 = K_2 = K = 30$ N/m

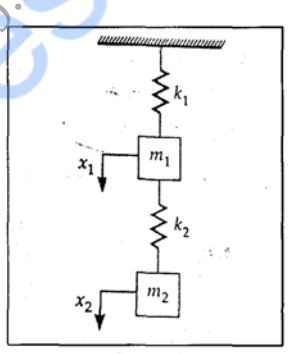

Fig. 5 a)

b) Explain the concept of torsionally equivalent shaft and derive equation for its equivalent length. **[7]**

OR

Q6) a) For the Spring mass system shown in Fig. 6 a), find Eigen values and Eigen vectors by matrix method **[10]**

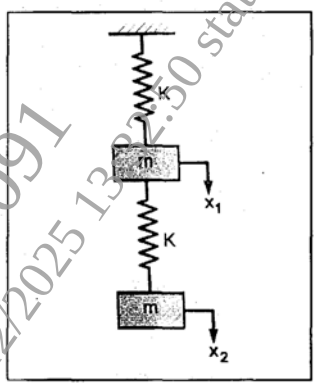

Fig. 6 a)

b) Explain the torsional vibrations of geared system neglecting inertia of gears. **[7]**

Q7) a) Explain time domain and frequency domain techniques for vibration monitoring. **[10]**

b) List the vibration measuring instruments. Explain any one in detail. **[8]**

OR

Q8) a) Explain in detail various types of sound filed in the vicinity of a sound source. **[10]**

b) What is the need of vibration control? Explain any two methods of vibration control. **[8]**