Roll No. .....

24480

B. Tech. 7th Semester (ME)
(Common with Special Chance)
Examination – December, 2019

MECHANICAL VIBRATION

Paper : ME-409-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions. Question No. 1 is ***compulsory*** and attempt ***one*** question from each Sections.

1. Explain the following :

(a) Resonance

(b) Whirling of rotating shaft

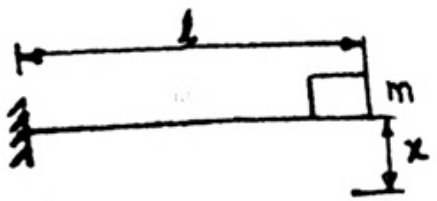
(c) Stiffness matrix

(d) Continuous and discrete vibration systems

https://www.mdustudy.com

SECTION – A

2. (a) Determine the natural frequency of the mass m placed at one end of cantilever beam of negligible mass as shown in figure below.



(b) Explain Rayleighs method and its uses.

3. A vibratory system in a vehicle is to be designed with the following parameters :

$$k = 100N/m,\ C = 2N\text{–}sec/m, m = 1kg$$

Calculate the decrease of amplitude from its starting value after 3 complete oscillations and the natural frequency of oscillation.

SECTION – B

4. 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. Assuming viscous damping, determine :

(a) The resonant frequency

(b) The phase angle at resonance

(c) The amplitude at resonance

(d) The frequency corresponding to the peak amplitude and

(e) Damped frequency

Take C = 40 N – sec/m

https://www.mdustudy.com

https://www.mdustudy.com

5. What is Damping ? Derive an expression for energy dissipated by damping in case of forced damped harmonic motion of a single degree of freedom system.

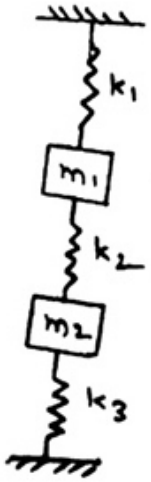
SECTION – C

6. For the system shown in figure find the two natural frequencies when

$m_1 = m_2 = m = 9.8$ kg

$k_1 = k_3 = 8820$ N/m

$k_2 = 3430$ N/m



Find out the resultant motion of m_1 and m_2 for the following different cases :

(a) Mass m_1 is displaced 5 mm downward and mass m_2 is displaced 7.5 mm downward. Both masses are releases simultaneously.

(b) Mass m_1 is displaced 5 mm upward while mass m_2 is held fixed. Both masses are then releases simultaneously.

7. What is the use of Dunkerley's Method ? Write its equation and explain it with suitable example.

SECTION – D

8. Derive expression for Torsional Vibration in a Rod.

9. What is Longitudinal Vibration ? Derive an expression for longitudinal vibration of Rod.