

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

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

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P. T. O.

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 :

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

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 :

- The resonant frequency
- The phase angle at resonance
- The amplitude at resonance
- The frequency corresponding to the peak amplitude and
- Damped frequency

$$\text{Take } C = 40 \text{ N - sec/m}$$

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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.

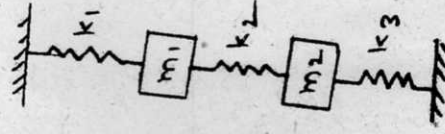
SECTION - C

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

$$m_1 = m_2 = m = 9.8 \text{ kg}$$

$$k_1 = k_3 = 8820 \text{ N/m}$$

$$k_2 = 3430 \text{ N/m}$$



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 released simultaneously.

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P. T. O.