B.Tech. 7th Semester (ME) F-Scheme Examination, December–2017

MECHANICAL VIBRATION

Paper–ME–409–F

Time allowed : 3 hours] *[Maximum marks : 100*

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

1. Explain following : 4×5=20

(a) Degree of freedom

(b) Critical Speed

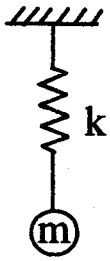
(c) Orthogonally of modes

(d) Continuous System.

Section–A

2. (a) Explain Energy Method in free single degree of freedom system. 10

(b) Determine the natural frequency of the system shown in figure where m = 10 kg and k = 5 N/mm. 10



3. What is Logarithmic Decrement ? Derive an expression for it. 20

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. Assume viscous damping, determine :
   (a) the resonance frequency
   (b) the phase angle at resonance
   (c) the amplitude of resonance
   (d) the frequency corresponding to the peak amplitude
   (e) damped frequency. 20

5. What do you understand by Transient Vibration ? Explain the system response to Step Input. 20

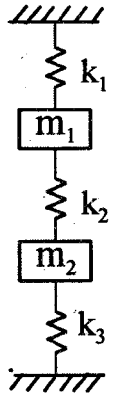
Section–C

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) Both masses are displaced 5 mm in the downward direction and released simultaneously.

(b) Both masses are displaced 5 mm; m_1 is in the downward direction and m_2 in the upward direction, and released simultaneously. 20

7. Explain method of Matrix Iteration for determining natural frequencies and mode shapes. 20

Section–D

8. What do you understand by Vibration of Continuous System ? Derive equation for Lateral Vibration of a Beam. 20

9. Explain Torsional Vibration. Derive an expression for Torsional Vibration in case of shaft having torque T acting at both ends. 20