Code No: G1504/R13

M. Tech. I Semester Supplementary Examinations, January-2017
MECHANICAL VIBRATIONS
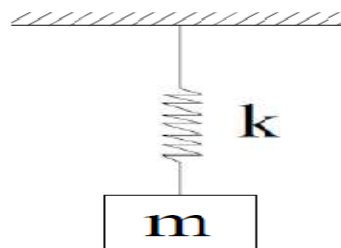**(Common to MD, MED and CAD/CAM)**

**Time: 3 hours**   **Max. Marks: 60**

Answer any FIVE Questions
### *All Questions Carry Equal Marks*

---

1. a   Determine the differential equation of a spring mass system (shown in the figure   6
        below) and its natural frequency by using
        i.   D' Alembert's principle
        ii. Rayleigh's method.

   b   Explain the classifications of vibration with examples.   6

2.   Find the natural frequency and mode shapes of the system if **m= 2 kg, K= 400 N/m**,   12
       for the figure given below.
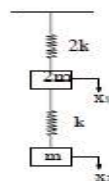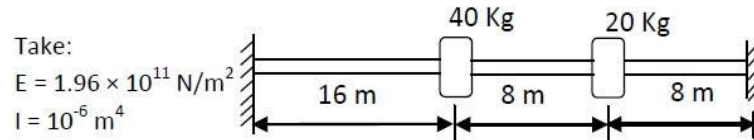

3.   Determine the Eigen values and test their orthogonality property for the given   12
       diagram.
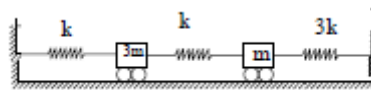
Code No: G1504/R13

4. a Find the natural frequency of transverse vibrations for the system shown below by Rayleigh Method.

   Take:
   E = 1.96 × 10^{11} N/m^2
   I = 10^{-6} m^4

   40 Kg   20 Kg
   16 m   8 m   8 m

   6

   b Explain with neat sketch of working of Vibrometer.   6

5. Explain the procedure adopted for Rayleigh method to determine the natural frequency of multi-degree of freedom system with an suitable example.   12

6. Prove that the critical speed of whirling speed for a rotating shaft is same as the frequency of natural transverse vibration.   12

7. a A mass of 50 kg suspended from spring produces a static deflection of 0.017m and when in motion, it experience a viscous damping force with a value of 250 N at a velocity of 0.3m/s. calculate the periodic time of damped vibration if the mass is then subjected to periodic disturbing force having a maximum value of 200N and making 2 Cps. Find the amplitude of the ultimate force.   6

   b Explain the transmissibility and transmitted force for a spring mass damper system.   6

8. Write short on any three of the following: 12
   a) Damping ratio
   b) Undamped system (no damped)
   c) Under damped
   d) Critical damped
   e) Logarithmic decrement.

*****