**Code No: I1503/R16**

**M. Tech. I Semester Regular Examinations, January-2017**

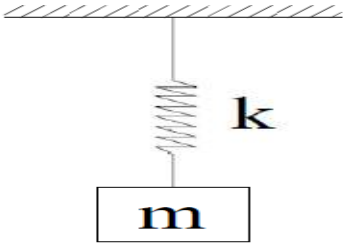
# MECHANICAL VIBRATIONS

**[Common for Machine Design (15), Mechanical Engg. Design (14), Computer Aided Analysis & Design (16), CAD/CAM (04) and Computer Aided Design & Manufacturing (09)]**

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

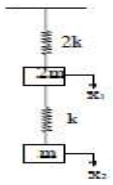
***Answer any FIVE Questions***
***All Questions Carry Equal***

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

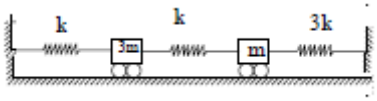



   b Explain the classifications of vibration with examples. 6

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




3. Determine the Eigen values and test their orthogonality property for the given diagram. 12



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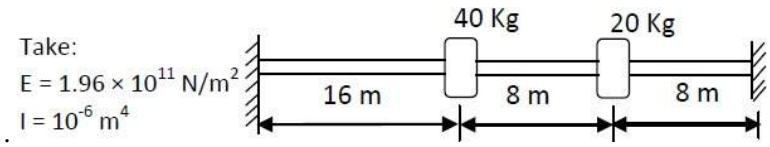
4. a Find the natural frequency of transverse vibrations for the system shown below by Rayleigh Method. 6




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.

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