

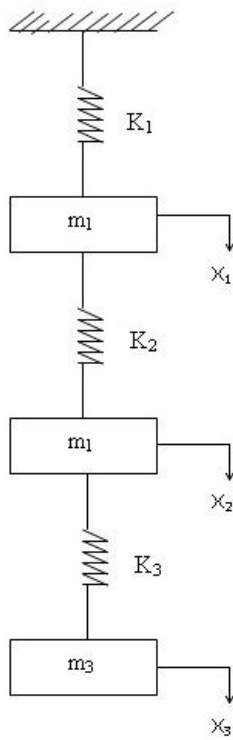
End Semester Examinations - 2015-16 Even Semester - May 2016

14ME3028 Advanced Mechanical Vibrations

Set A

Time : 3 hrs
Total Marks: 100

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1. With example, explain the types of damping used in mechanical systems
- OR**
2. A) A vibrating system consists of a mass of 50 kg, a spring of stiffness 30×10^3 N/m and a damper. The damping provided is only 20% of the critical value. Determine the damping factor, critical damping co-efficient, natural frequency of damped vibration, logarithmic decrement
- (10 MARKS)
- B) A gun barrel weighing 5340 N has a recoil spring of stiffness 292 kN /m. If the barrel recoils 1.22 m on firing, determine: (a) the initial recoil velocity of the barrel, (b) the critical damping co-efficient of a dashpot which is engaged at the end of the recoil stroke
- (10 MARKS)
3. A single cylinder engine of total mass 200kg is to be mounted on an elastic support, which permits vibratory movement in vertical direction only. The mass of the piston is 3.5kg and has a vertical reciprocating motion, which may be assumed simple harmonic with stroke of 150mm. It is desired that the maximum vibratory force transmitted through the elastic support to the foundation shall be 600N when the engine speed is 800rpm and less than this at all higher speeds
- a. Find the necessary stiffness of the elastic support and the amplitude of vibration at 800 rpm.
- b. If the engine speed is reduced below 800 rpm at what speed will the transmitted force again becomes 600 N.
- OR**
4. Derive the relation between Dynamic and Static amplitude of motion for Forced Vibrations of Undamped systems
5. A diesel engine of weight 3000N is supported on a pedestal mount. It has been observed that the engine induces vibration into the surrounding area through its pedestal mount at an operating speed of 6000rpm. Determine the parameters of the vibration absorber that will reduce the vibration when mounted on the pedestal. The magnitude of the exciting force is 250N and the amplitude of motion of the auxiliary mass is to be limited to 2mm.
- OR**
6. A 300kg machine is placed at the end of a cantilever beam of length 1.8m, Elastic modulus 200GPa, and Moment of Inertia $1.8 \times 10^{-5} \text{ m}^4$. When the machine operates at 1000 rpm, it has steady state amplitude of 0.8mm. What is the steady state amplitude of the machine when a 30kg absorber of damping coefficient 650Ns/m and stiffness 1.5×10^5 N/m is added to the end of the beam?
7. Find the natural frequencies of the system shown in Figure1 for $K_1 = K_2 = K_3 = K$ and $m_1 = m_2 = m_3 = m$ using matrix iteration method.



OR

8. Determine the natural frequency of the spring mass system shown in Figure 1 using Stodola's method. Take $K_1 = K_2 = K_3 = K$ and $m_1 = m_2 = m_3 = m$

9. With a neat sketch, explain displacement measuring instrument

Wishing you All the Best
