B.E. (Mechanical Engineering) Eighth Semester (C.B.S.)

Elective-III : Mechanical Vibrations

P. Pages : 3 **NRT/KS/19/3673**

Time : Three Hours * 0 7 1 9 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams should be given whenever necessary.
11. Use of non programmable calculator is permitted.

1. a) Explain Coulomb or dry friction damping. **6**

b) Find natural frequency of system as shown in fig. 1 (b). The cord may be assumed inextensible in spring mass pulley system there being no slip between cord pulley. **7**

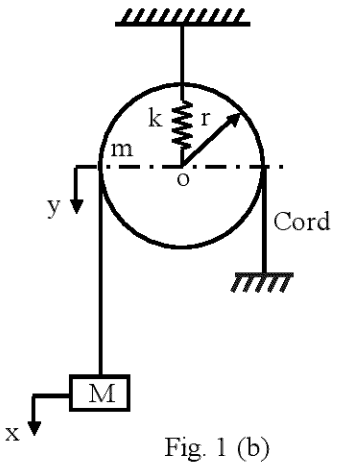


Fig. 1 (b)

OR

2. a) What do you mean by Vibration Isolation? Explain various methods used. **6**

b) A vibratory system in a vehicle is to be designed with the following parameters. **7**
$k = 100\,N/m$, $C = 2N\text{-}sec/m$, $m = 1kg$
Calculate the degree of amplitude from its starting value after 3 complete oscillators & frequency of oscillation.

3. a) Explain dynamic vibration absorber with differential equation. **6**

b) A machine runs at 5500 rpm. Its forcing frequency is very near to the natural frequency. If the nearest frequency of the machine is to be atleast 20% from the forced frequency, design as suitable vibration absorber for the system. Assume the mass of the machine as 30 kg. **7**

OR

4. Using Lagranges method, determine the equation of motion for 3 DOF system as shown in fig. (4). **13**

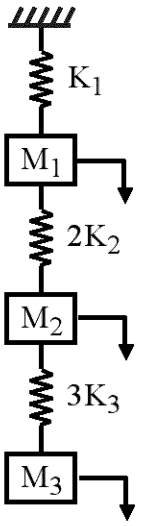
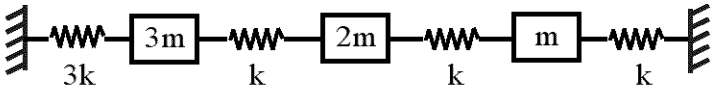


Fig. (4)

5. Using matrix iteration method, determine the natural frequency of the system as shown in fig. (5). **14**



m=3 kg, k=150 N/m Fig. (5)

OR

6. Using Holzer's method, determine the natural frequency of the system shown in figure (6) **14**

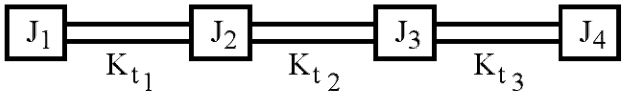


Fig. (6)

7. a) Derive a suitable expression of motion for Longitudinal vibration for system as shown in fig. 7(a). **6**

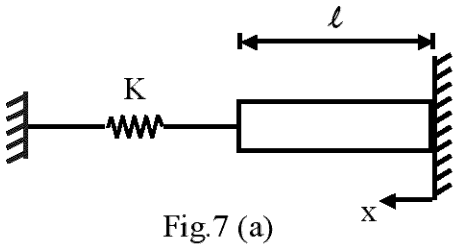


Fig.7 (a)

b) A bar of uniform cross section having length ℓ is fixed at both ends. The bar is subjected to Longitudinal vibration barring a constant velocity V_0 at all points. Derive suitable mathematical expression of longitudinal vibration. **8**

OR

8. A uniform string as shown in fig. (8) of length ℓ & a large initial tension S, stretched between two supports is displaced laterally through a distance a_0 at the centre as shown in figure, and released at $t = 0$. Find the eq^n of motion for string. **14**

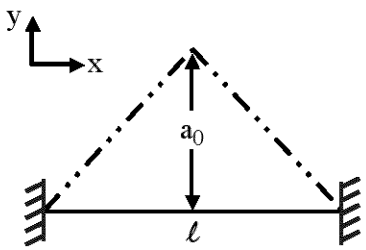


Fig. (8)

9. Derive transformation co-ordinates matrix for the planer structure. **13**

OR

10. Using FEM, approximate the lowest natural frequency & mode shape for uniform fixed – free beam. **13**

11. Write short notes on **any three.** **13**

a) Accelerometer

b) Spectrum analyser

c) Vibration pick up

d) Seismometers.

OR

12. a) Explain in details, vibration based conditioned monitoring. **7**

b) Explain with two practical examples, significance of vibration measurement & monitoring. **6**

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