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

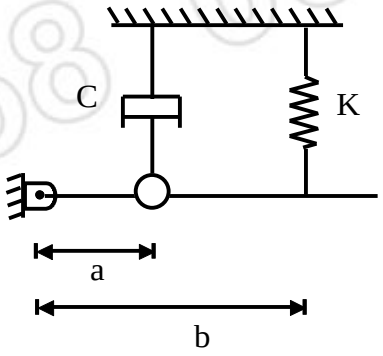
Elective - III : Mechanical Vibrations

P. Pages : 3 **NKT/KS/17/7591**

Time : Three Hours * 0 7 5 3 * 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. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Determine suitable expression for equation of motion of the damped vibratory system shown in figure find the critical damping coefficient when a = 0.15 m, b = 0.13 m, k = 5500 N/m and M = 2 kg. **8**

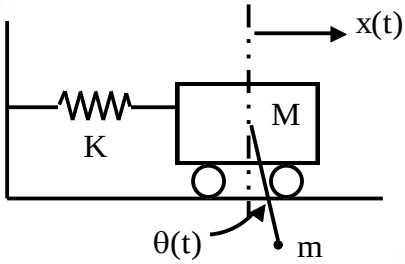


b) What are different types of damping ? Explain with example. **5**

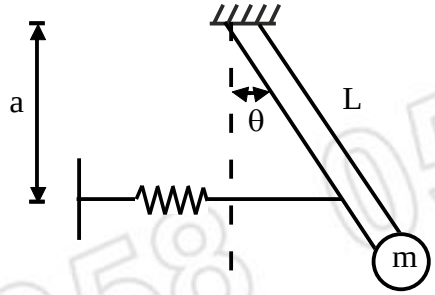
OR

2. a) Derive and explain "equation of motion" for single DOF system with example. **6**

b) By using Lagranges equation determine the equation of motion for a pendulum of length 'ℓ' and weight mg. which is pivoled to mass 'M' as shown in figure. **7**



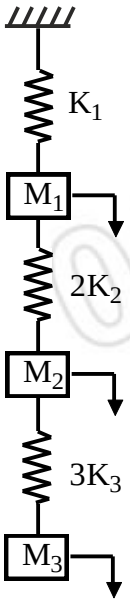
3. a) Calculate natural frequency of the swing of mass 'm' as shown in fig. **7**



b) Explain the Holzer method for determining natural frequency of a multidisc rotor. **6**

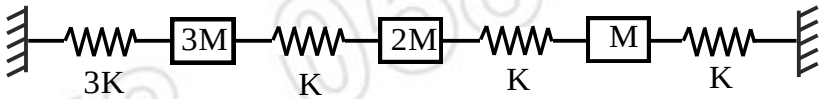
OR

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



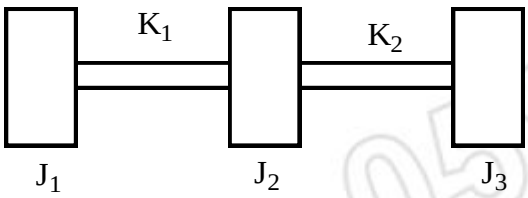
5. Using Matrix iteration method determine the natural frequency of the system shown in figure. **14**

m = 3kg
k = 150 N/m



OR

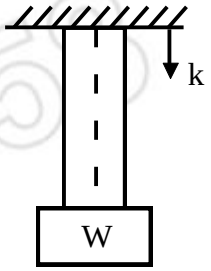
6. Use the Holzer method to determine the natural frequency for $J_1 = J_2 = J_3 = 1$ and $K_1 = K_2 = 1$. **14**



7. Applying Hamilton principle, derive the frequency equation of axial vibration of a rod clamped at one end and free at other end. **13**

OR

8. a) A bar of length L is fixed at one end and has a concentrated mass attached at other end as shown in fig. Derive the frequency equation. **10**



b) Discuss Rayleigh quotient. **3**

9. a) What is difference between FEM and Rayleigh-Ritz method. **4**

b) Explain shape function for rod and beam. **6**

c) Define transfer matrix. **4**

OR

10. Using FEM, approximate the lowest natural frequency and mode shape for a uniform fixed-free beam. **14**

11. Write short notes on : **13**

a) Seismometer.

b) Vibration pickups.

c) Digital vibration measurement.

d) Vibration condition monitoring.

OR

12. a) Explain in brief the role and application of FFT analyzer in vibration measurement. **7**

b) Explain "Sound Insulation". **3**

c) Characteristics of non linear system in comparison with linear system. **3**

****