PVP 12

Code: **MEMD2T2**

I M.Tech - II Semester - Regular Examinations - August 2014

MECHANICAL VIBRATIONS
(MACHINE DESIGN)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Determine the effect of self weight on the natural frequency of vibration of the pinned-pinned beam shown in Fig 1. 8 M

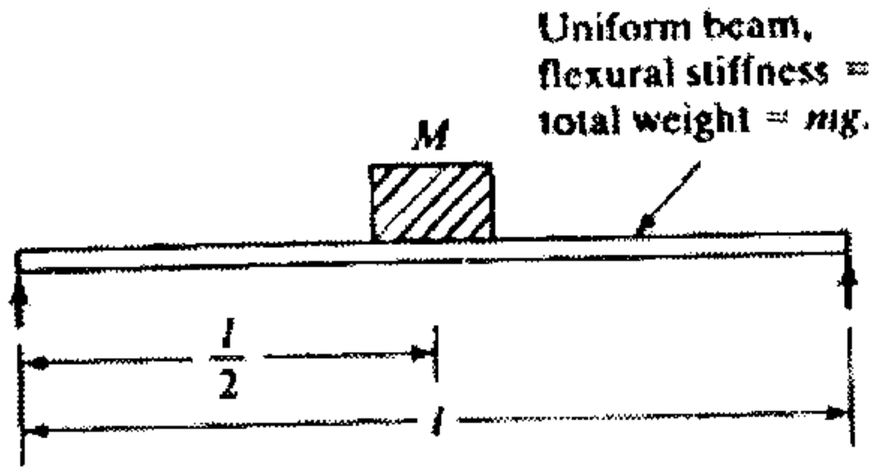

Fig 1

b) Define the terms harmonic motion, time period and degree of freedom. 6 M

2. Derive the equation of motion and find the steady state solution of the system shown in the Fig 2 for rotational motion about the hinge O for the following data:
k=5000N/m, l=1m, m=10kg, M_0=100Nm, ω=1000rpm. 14 M

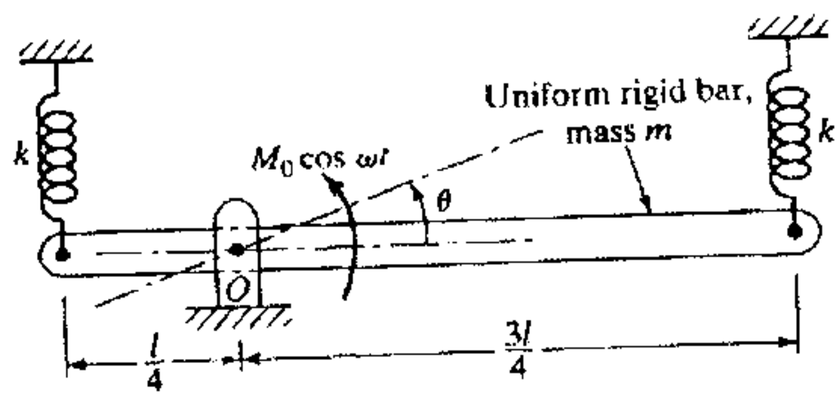

Fig 2

3. Determine the equations of motion and the natural frequencies of the system shown in the Fig 3. 14 M

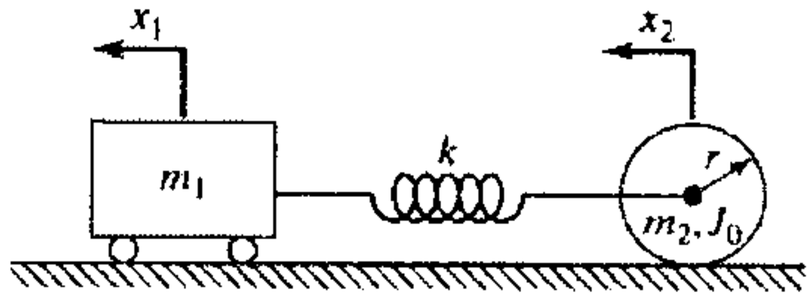

Fig 3

4. Derive the flexibility and stiffness matrices of the spring mass system shown in the Fig 4, assuming that all the contacting surfaces are frictionless. 14 M

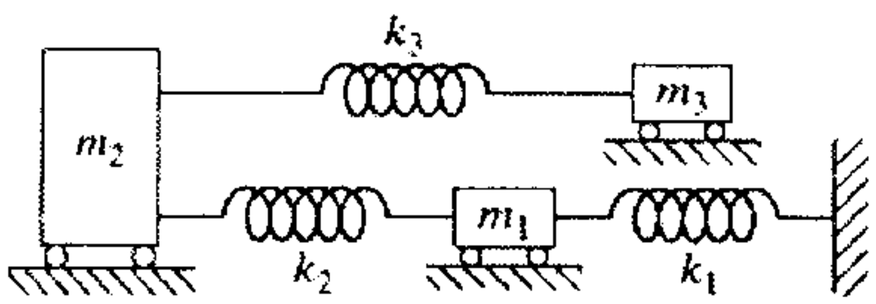

Fig 4

5. Determine the natural frequencies of vibration of a uniform beam fixed at x=0 and simply supported at x=l. 14 M

6. Using Holzer's method, find the natural frequencies and mode shapes of the system shown in Fig 5. Assume that J_1=10 kg-m^2, J_2=5 kg-m^2, J_3=1 kg-m^2, and $k_{t1} = k_{t2}$=10^6 N-m / rad. 14 M

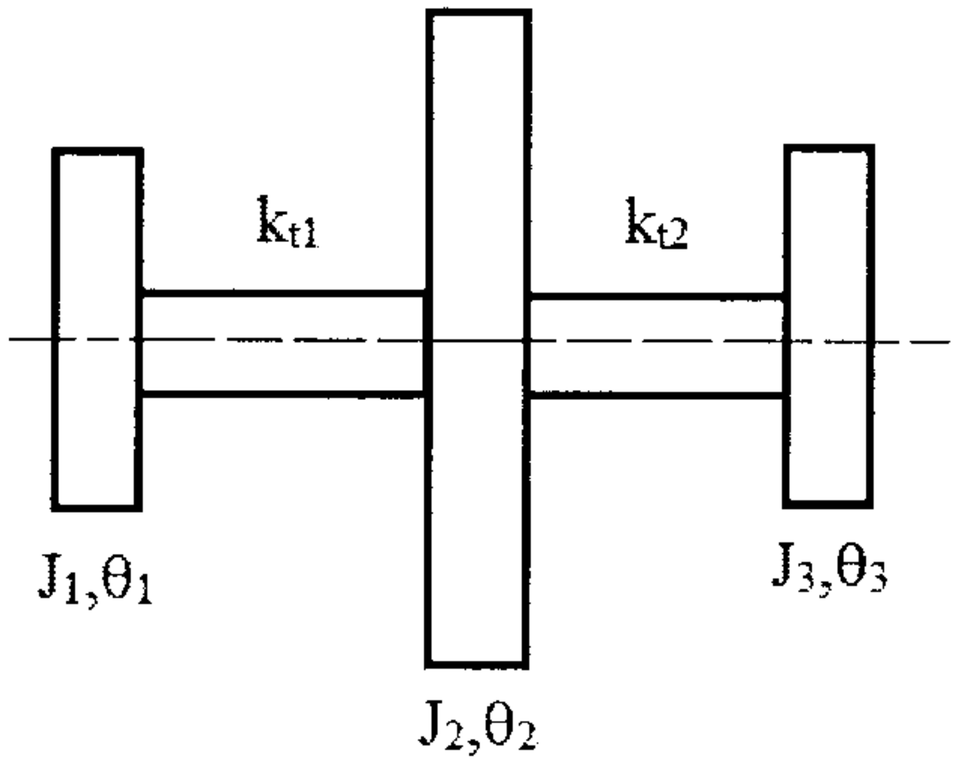

Fig 5

7. Determine the response of an undamped single degree freedom subjected to the following excitations. 14 M
   a) Step input
   b) impulsive input

8. A shaft, having a stiffness of 3.75MN/m, rotates at 3600rpm. A rotor, having a mass of 60kg and an eccentricity of 2000micron, is mounted on the shaft. Determine
   a) the steady state whirl amplitude of the rotor and
   b) the maximum whirl amplitude of the rotor during startup and stopping conditions.

Assume the damping ratio of the system as 0.05. 14 M