1) The system shown in Fig. 1. consists of a uniform slender rod of mass m and length l. The rod is connected at its center of mass to a linear spring with stiffness coefficient k. The system is subjected to a harmonic forcing function $F(t)=F_0 \sin\omega t$. Determine differential equation of motion and the complete solution in terms of the initial conditions ϑ_0 and $\dot{\vartheta}_0$. Assume small angular oscillation.
2) Find the differential equation of the torsional system shown in Fig. 2. If the torque is given by $T(t) = T_0 \sin\omega t$, determine the complete solution for zero initial conditions.
3) Assuming small oscillations, derive the differential equation of motion of the system shown in Fig. 3. Determine the complete solution in terms of the initial conditions ϑ_0 and $\dot{\vartheta}_0$.
4) Assuming small oscillations, derive the differential equation of motion of the system shown in Fig. 4. Determine also the steady state response of this system.
5) Derive the differential equation of motion of the system shown in Fig. 5. Obtain the steady state response of the absolute motion of the mass.
6) In problem 5, determine the steady state amplitude of the force transmitted to the moving base.

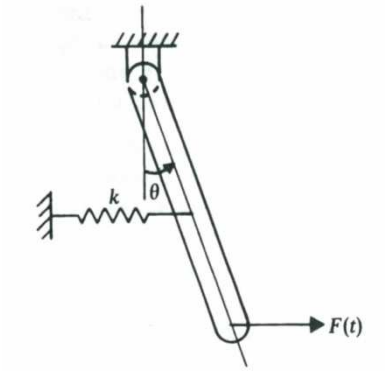

Figure 1

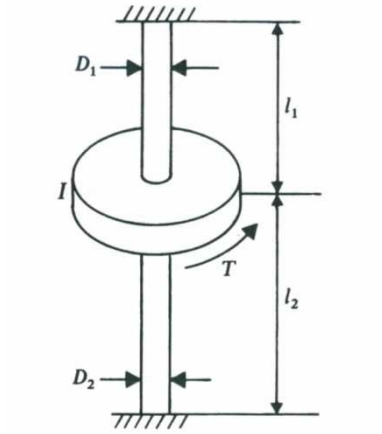

Figure 2

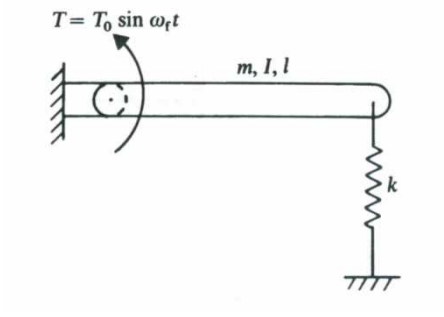

Figure 3

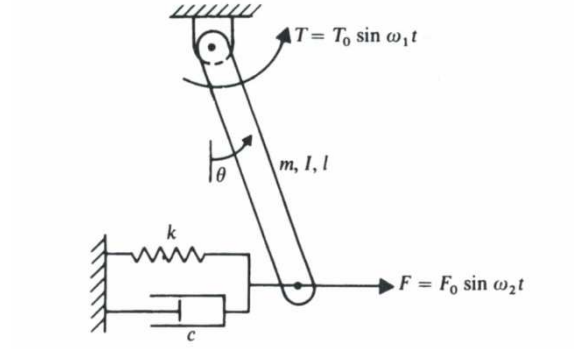

Figure 4

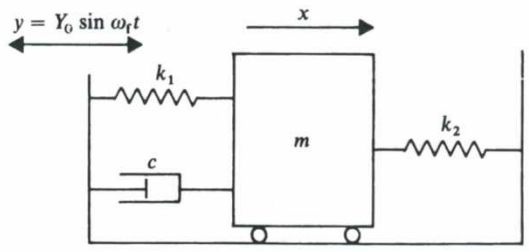

Figure 5