3. A three story steel frame building can be approximated as three equal concentrated masses and three massless springs of lateral spring constants 3k, 2k, k. During lateral vibration of the structure it is assumed that the floors move parallel to each other so that a shearing action predominates. The spring constants define the shearing force per unit lateral displacement; i.e. the horizontal shearing force on the top force is k times the relative displacement between the top and the middle floors.

a) Find the natural frequencies of small lateral vibrations.
b) Find the mode shapes associated with the natural frequencies.
c) Find the steady state displacement of the floors during an earthquake if the ground motion is a side to side displacement given by d = D sin($\sqrt{k/m}\,t$)