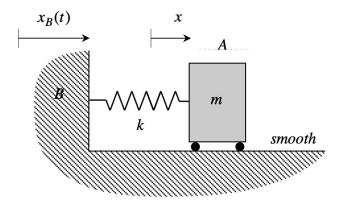**Homework 6.K**

Given: Ground motion during an earthquake event is often represented by a prescribed motion $x_B(t)$ for the ground. Structures attached to the ground experience an excitation due to this ground motion. Consider here a structure of mass m and support stiffness k attached to ground during an earthquake event. Let x represent the motion of this structure shown in the figure.

Find: For this problem:
(a) Derive the differential equation of motion (EOM) for the structure in terms of the coordinate x;
(b) Recognizing that the strain in the structure support is an important measure of the response and that strain is related to the relative motion between A and B, write the EOM in (a) above in terms of the relative coordinate $z(t) = x(t) - x_B(t)$. Compare this EOM with that found in (a);
(c) Consider a ground motion of $x_B(t) = b \sin\Omega t$. Determine the particular solution for the EOMs in (a) and (b); and,
(d) Make sketches of the amplitude of response for these two solutions. Compare the results. Are they consistent?