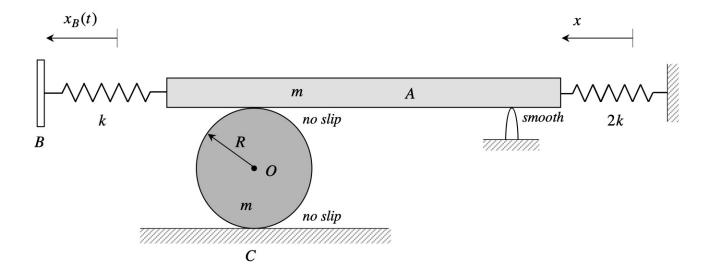**Homework H6.N**

Given: A homogeneous disk of mass m and with an outer radius of R rolls without slipping on a rough horizontal surface. Bar A (of mass m) is attached to a grounded spring of stiffness $2k$ on its right end. The left end of A is attached to a spring (of stiffness k) connected to a moveable base B. Bar A is supported by the top of the disk, with A not slipping on the disk as the system moves. The base B is given a prescribed motion of $x_B(t) = b\ sin\Omega t$. Let x measure the position of A from its position when the springs are unstretched; i.e., $x = 0$ when the springs are unstretched.

Find: For this problem:
(a) Derive the differential equation of motion (EOM) for the system in terms of the coordinate x;
(b) Determine the natural frequency ω_n of the system;
(c) Determine the particular solution of the EOM; and,
(d) If $\Omega = 0.5\ \omega_n$, does A move in phase or out of phase with B?