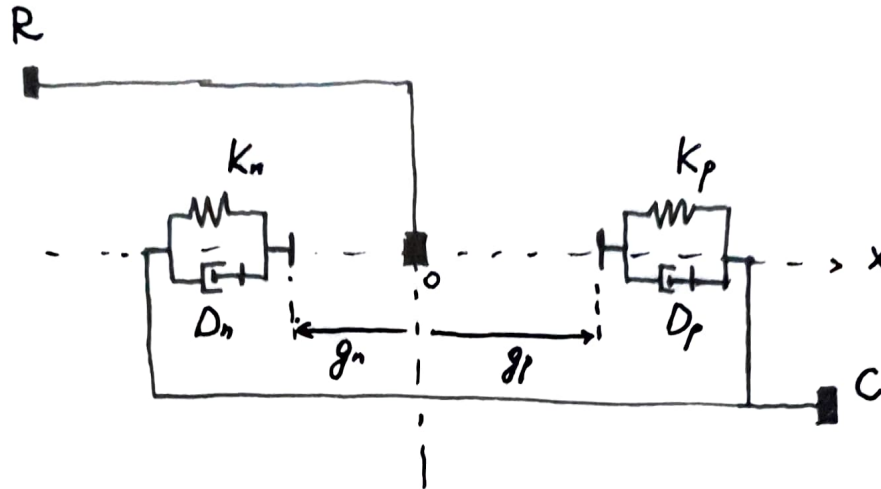# Hard Stop

g_n, g_p - gaps

①
$$F = \begin{cases} K_p \cdot (x - g_p) + D_p \cdot v & \text{for } x \geq g_p \\ 0 & \text{for } g_n < x < g_p \\ K_n (x - g_n) + D_n \cdot v & \text{for } x \leq g_n \end{cases}$$

$$v = \frac{dx}{dt}$$

②
$$F = \begin{cases} K_p (x - g_p) + D_p v \cdot ge(v, 0) & \text{for } x \geq g_p \\ 0 & \text{for } g_n < x < g_p \\ K_n (x - g_n) + D_n v \, le(v, 0) & \text{for } x \leq g_n \end{cases}$$