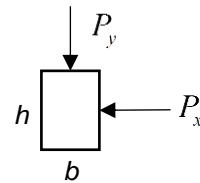
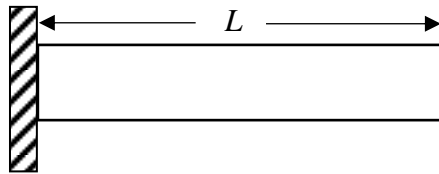


2. A cantilever beam is subject to two random, forces  $P_x \sim N(4000, 250^2)$  N and  $P_y \sim N(2000, 150^2)$  N at the tip as shown. The allowable deflection of the beam is  $d_o = 0.025$  m. The beam has the dimensions of  $L = 1.5$  m,  $b = 0.05$  m, and  $h = 0.1$  m. The Young's Modulus is  $E = 210$  GPa. The yield strength is  $S_y \sim N(250, 20^2)$  MPa. If  $P_x$ ,  $P_y$ , and  $S_y$  are independent, find the system probability of failure of the beam.

Hint:

$$g_1 = d_o - \frac{4L^3}{E} \sqrt{\left(\frac{P_x}{b^3h}\right)^2 + \left(\frac{P_y}{bh^3}\right)^2}$$

$$g_2 = S_y - \frac{6P_xL}{b^2h} - \frac{6P_yL}{bh^2}$$



### Solution

[See Matlab code]