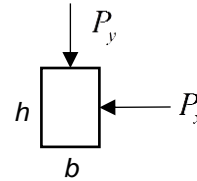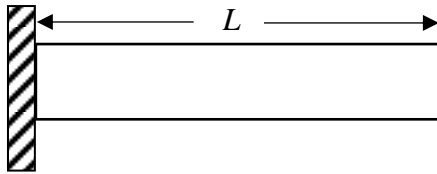1. A cantilever beam is subject to two random, forces $P_x \sim N(4000, 250^2)$ N and $P_y \sim N(2000, 150^2)$ N at the tip as shown. The allowable deflection of the beam is $d_o = 0.025$ m. The beam has the dimensions of $L = 1.5$ m, $b = 0.05$ m, and $h = 0.1$ m. The Young's Modulus is $E = 210$ GPa.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

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

Solution

[See Matlab code]