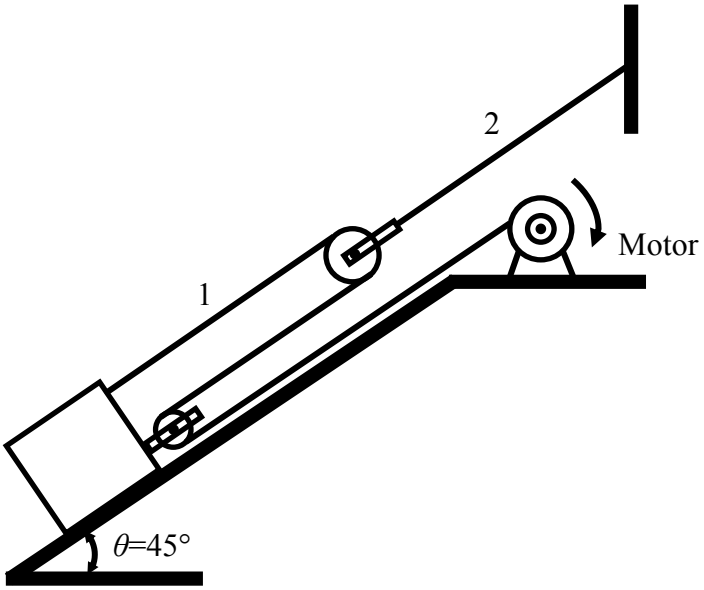
17. A frictionless pulley system, which lifts a box, is shown in the figure. The weight of the box follows a normal distribution $W \sim N(1000, 80^2)$ kN. The coefficient of friction between the box and the surface τ is 0.25. The resistances of the two cables follow distributions $S_1 \sim N(400, 45^2)$ kN and $S_2 \sim N(800, 80^2)$ kN. Determine the probabilities of failure of the cables. W, S_1, and S_2 are independently distributed.



Solution

The probabilities of failure of cable 1 and cable 2 are $p_{f1} = 0.019$ and $p_{f2} = 0.0116$.