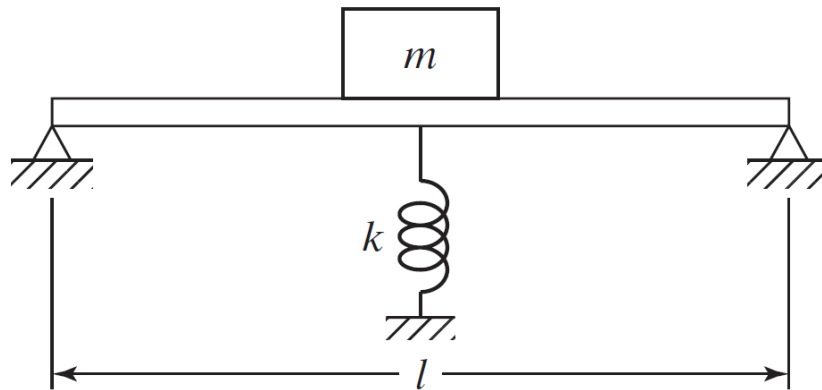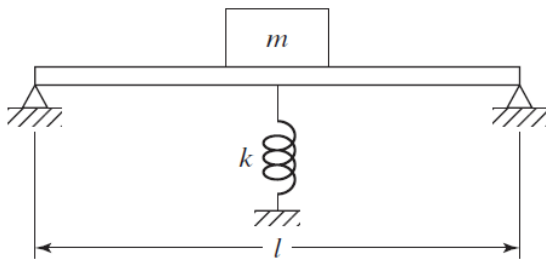## How to solve problem 1.11 of mechanical vibration of S. S. Rao Ed. 6

1.11 A machine of mass $m = 500$ kg is mounted on a simply supported steel beam of length $l = 2$ m having a rectangular cross section (depth $= 0.1$ m, width $= 1.2$ m) and Young's modulus $E = 2.06 \times 10^{11}$ N/m². To reduce the vertical deflection of the beam, a spring of stiffness k is attached at mid-span, as shown in Fig. 1.71. Determine the value of k needed to reduce the deflection of the beam by

a. 25 percent of its original value.
b. 50 percent of its original value.
c. 75 percent of its original value.

Assume that the mass of the beam is negligible.

Cross-section area

m=500 kg

E=2.06×10¹¹ N/m²

d=0.1 m

w=1.2 m