2012 F=ma Exam: Problem 8

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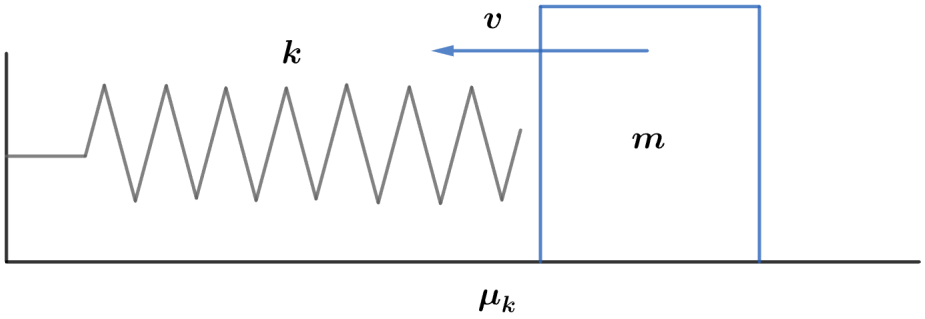

By conservation of energy, the initial kinetic energy of the block is converted to spring potential energy and energy dissipated by friction. We have

$$K = U_{\text{spr}} + E_{\text{dis}}$$
$$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 + \mu_k mgx$$
$$kx^2 + (2\mu_k mg)x - mv^2 = 0$$

Solving for x using the quadratic equation,

$$x = \frac{-2\mu_k mg + \sqrt{(2\mu_k mg)^2 - 4k(-mv^2)}}{2k} = -\frac{\mu_k mg}{k} + \sqrt{\left(\frac{\mu_k mg}{k}\right)^2 + \frac{mv^2}{k}} = 0.24\,\text{m}$$

where we took the positive root since $x > 0$ under our sign convention. Thus, the answer is $\boxed{\text{B}}$.