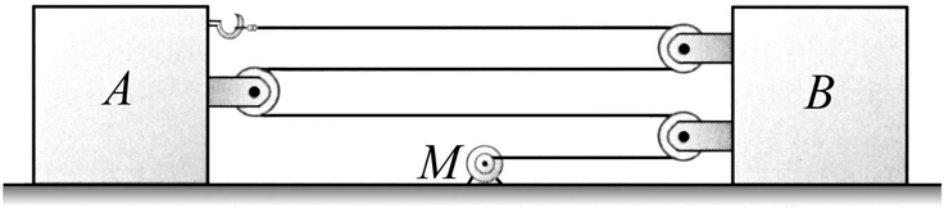
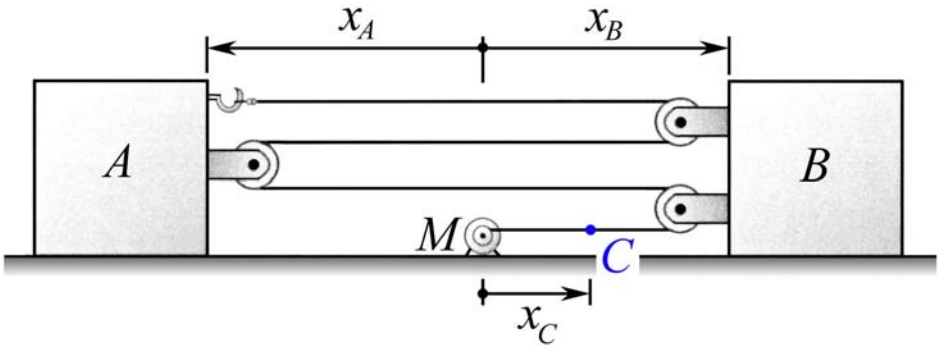
MEEG 2013 Quiz #1.m05

The motor at M as shown winds the cable at a constant rate of 520 mm/s. If the block B moves with $\mathbf{v}_B$ =100 mm/s ←, determine the velocity $\mathbf{v}_A$ of block A.





③

Let C be a point on the cable as shown. We have

$\mathbf{v}_C = 520$ mm/s ← $\quad\therefore\quad v_C = -520$ mm/s ①

$\mathbf{v}_B = 100$ mm/s ← $\quad\therefore\quad v_B = -100$ mm/s ①

Constraint condition:

$$3x_A + 3x_B + (x_B - x_C) = k \qquad 3x_A + 4x_B - x_C = k$$

$$3v_A + 4v_B - v_C = 0 \qquad 3v_A + 4(-100) - (-520) = 0$$

$$v_A = -40 \qquad \therefore \quad \mathbf{v}_A = 40 \text{ mm/s} \rightarrow \qquad ⑤$$