

24. To be on the verge of slipping means that the force exerted on the smaller block (at the point of maximum acceleration) is  $f_{\max} = \mu_s mg$ . The textbook notes (in the discussion immediately after Eq. 15-7) that the acceleration amplitude is  $a_m = \omega^2 x_m$ , where  $\omega = \sqrt{k/(m+M)}$  is the angular frequency (from Eq. 15-12). Therefore, using Newton's second law, we have

$$ma_m = \mu_s mg \Rightarrow \frac{k}{m+M} x_m = \mu_s g$$

which leads to

$$x_m = \frac{\mu_s g(m+M)}{k} = \frac{(0.40)(9.8 \text{ m/s}^2)(1.8 \text{ kg} + 10 \text{ kg})}{200 \text{ N/m}} = 0.23 \text{ m} = 23 \text{ cm}.$$