

$$\textcircled{1} \quad y(x,t) = (2.30 \text{ mm}) \sin(1822x - 588t)$$

compare with $y(x,t) = y_m \sin(kx - \omega t)$

$$(a) \quad y_m = 2.30 \text{ mm}$$

$$(b) \quad \omega = 588 \text{ rad/s} \quad f = \frac{\omega}{2\pi} = \frac{588 \text{ rad/s}}{2\pi} = 93.6 \text{ Hz}$$

$$(c) \quad k = 1822 \text{ rad/m} \quad \lambda = \frac{2\pi}{k} = \frac{2\pi}{1822 \text{ rad/m}} = 3.46 \times 10^{-3} \text{ m}$$

$$(d) \quad v = f\lambda = 0.323 \text{ m/s}$$

$$(e) \quad (u_y)_{\text{max}} = \omega y_m = 1.35 \text{ m/s}$$

$$\textcircled{2} \quad v = \sqrt{\frac{F}{\mu}} \quad \mu = \frac{F}{v^2} = \frac{123 \text{ N}}{(172 \text{ m/s})^2} = 4.16 \times 10^{-3} \text{ kg/m}$$

$$F = \mu v^2 = (4.16 \times 10^{-3} \text{ kg/m})(180 \text{ m/s})^2 = 135 \text{ N}$$

$$\textcircled{3} \quad \mu = m/L = 0.107 \text{ kg} / 9.88 \text{ m} = 1.083 \times 10^{-2} \text{ kg/m}$$

$$v = \sqrt{\frac{F}{\mu}} = \sqrt{\frac{2360}{1.083 \times 10^{-2} \text{ kg/m}}} = 147.6 \text{ m/s}$$

$$f_1 = \frac{v}{2L} = \frac{147.6 \text{ m/s}}{2(9.88 \text{ m})} = 7.47 \text{ Hz}$$

$$f_2 = 2f_1 = 14.9 \text{ Hz}$$

$$f_3 = 3f_1 = 22.4 \text{ Hz}$$