2018A F=ma Exam: Problem 13

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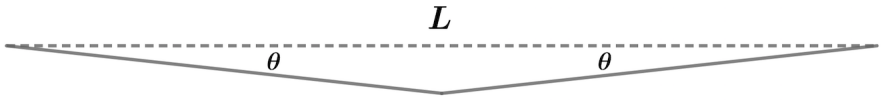

Recall the Young's modulus is given by

$$Y = \frac{F/A}{\Delta L/L}$$

Given $T = 7300\,\mathrm{N}, R = d/2 = 0.0127\,\mathrm{m}, L = 18.0\,\mathrm{m}, \theta = 1.50°$, we have

$$F = T$$

$$A = \pi R^2$$

$$\Delta L = \frac{L}{\cos\theta} - L$$

Thus,

$$Y = \frac{T/(\pi R^2)}{(1/\cos\theta) - 1} = 4.2 \times 10^{10}\,\mathrm{N/m^2}$$

so the answer is $\boxed{\mathrm{E}}$.