10. A thin 1 m long rod has a radius of 5 mm. A force of $50\,\pi\,kN$ is applied at one end to determine its Young's modulus. Assume that the force is exactly known. If the least count in the measurement of all lengths is 0.01 mm, which of the following statements is false ? [Online April 10, 2016]

(a) The maximum value of Y that can be determined is $2 \times 10^{14} N/m^2$.

(b) $\dfrac{\Delta Y}{Y}$ gets minimum contribution from the uncertainty in the length

(c) $\dfrac{\Delta Y}{Y}$ gets its maximum contribution from the uncertainty in strain

(d) The figure of merit is the largest for the length of the rod.

10. **(a)** Young's modulus $Y = \dfrac{F}{A} / \dfrac{\Delta\ell}{\ell}$

$$Y = \frac{F\ell}{\pi r^2 \Delta\ell}$$

Given, radius $r = 5$ mm, force $F = 50\pi k$ N,

$$\frac{\ell}{\Delta\ell} = 0.01 \text{ mm}$$

$$\therefore Y = \frac{F}{\pi r^2} \frac{\ell}{\Delta\ell} = 2 \times 10^{14} \text{ N}/\text{m}^2.$$