Given Data:-

$A = 20\text{mm} \times 20\text{mm} = 400\text{mm}^2$

$P = 100\text{kN} = 100 \times 10^3\text{N}$ (C)

$l = 50\text{mm}$

$E = 2.14 \times 10^3\ \text{kN/mm}^2 = 2.14 \times 10^3 \times 10^3\text{N/mm}^2$

To find:- $E = 2.14 \times 10^5\text{N/mm}^2$

$\delta l = ?$

Formulae used:-

$\sigma = \frac{P}{A}$

$\varepsilon(\text{or})e = \frac{\delta l}{l}$

$E = \frac{\sigma}{\varepsilon(\text{or})e}$

Soln:-

$\sigma = \frac{100 \times 10^3}{400} = 250\text{N/mm}^2$

$E = \frac{\sigma}{\varepsilon(\text{or})e} \Rightarrow \varepsilon(\text{or})e = \frac{250}{2.14 \times 10^5} = 1.17 \times 10^{-3}$

$1.17 \times 10^{-3} = \frac{\delta l}{50}$

$1.17 \times 10^{-3} \times 50 = \delta l \Rightarrow \delta l = 0.058\text{mm}$

Result:-

$\sigma = 250\text{N/mm}^2$

$\varepsilon(\text{or})e = 1.17 \times 10^{-3}$

$\delta l = 0.058\text{mm}$