14. A copper wire of length 1.0 m and a steel wire of length 0.5 m having equal cross-sectional areas are joined end to end. The composite wire is stretched by a certain load which stretches the copper wire by 1 mm. If the Young's modulii of copper and steel are respectively 1.0×10^{11} Nm^{-2} and 2.0×10^{11} Nm^{-2}, the total extension of the composite wire is : **[Online April 23, 2013]**

(a) 1.75 mm (b) 2.0 mm (c) 1.50 mm (d) 1.25 mm

14. **(d)** $Y_c \times (\Delta L_c / L_c) = Y_s \times (\Delta L_s / L_s)$

$$\Rightarrow 1\times10^{11}\times\left(\frac{1\times10^{-3}}{1}\right)=2\times10^{11}\times\left(\frac{\Delta L_s}{0.5}\right)$$

$$\therefore\ \Delta L_s = \frac{0.5\times10^{-3}}{2} = 0.25\ \text{mm}$$

Therefore, total extension of the composite wire

$= \Delta L_c + \Delta L_s$

$= 1\ \text{mm} + 0.25\ \text{m} = 1.25\ \text{m}$