3. A uniform cylindrical rod of length L and radius r, is made from a material whose Young's modulus of Elasticity equals Y. When this rod is heated by temperature T and simultaneously subjected to a net longitudinal compressional force F, its length remains unchanged. The coefficient of volume expansion, of the material of the rod, is (nearly) equal to : **[12 April 2019 II]**

(a) $9F/(\pi r^2 YT)$ (b) $6F/(\pi r^2 YT$

(c) $3F/(\pi r^2 YT)$ (d) $F/(3\pi r^2 YT)$

3. **(c)** $\Delta_{\text{temp}} = \Delta_{\text{force}}$

or $L\alpha(\Delta T) = \dfrac{FL}{AY}$ $\quad\therefore\quad \alpha = \dfrac{FL}{AYT} = \dfrac{F}{\pi r^2 YT}$

Coefficient of volume expression

$r = 3\alpha = \dfrac{3F}{\pi r^2 YT}$.