

4. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4x}$ is equal to : [JEE M 2015]

- (a) 2 (b) $\frac{1}{2}$ (c) 4 (d) 3

Solution: -

4. (a) Multiply and divide by x in the given expression, we get

$$\begin{aligned} & \lim_{x \rightarrow 0} \frac{(1 - \cos 2x)}{x^2} \cdot \frac{(3 + \cos x)}{1} \cdot \frac{x}{\tan 4x} \\ &= \lim_{x \rightarrow 0} \frac{2 \sin^2 x}{x^2} \cdot \frac{3 + \cos x}{1} \cdot \frac{x}{\tan 4x} \\ &= 2 \lim_{x \rightarrow 0} \frac{\sin^2 x}{x^2} \cdot \lim_{x \rightarrow 0} (3 + \cos x) \cdot \lim_{x \rightarrow 0} \frac{x}{\tan 4x} \\ &= 2.4 \cdot \frac{1}{4} \lim_{x \rightarrow 0} \frac{4x}{\tan 4x} = 2.4 \cdot \frac{1}{4} = 2 \end{aligned}$$