Past Year JEE Questions

Questions

Quetion: 01

If $L = \sin^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$ and

$M = \cos^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$, then :

A. $L = -\frac{1}{2\sqrt{2}} + \frac{1}{2}\cos\frac{\pi}{8}$

B. $M = \frac{1}{2\sqrt{2}} + \frac{1}{2}\cos\frac{\pi}{8}$

C. $M = \frac{1}{4\sqrt{2}} + \frac{1}{4}\cos\frac{\pi}{8}$

D. $L = \frac{1}{4\sqrt{2}} - \frac{1}{4}\cos\frac{\pi}{8}$

Solutions

Solution: 01

Explanation

We will use here those two formulas,

$\sin^2\theta = \frac{1-\cos 2\theta}{2}$ and $\cos^2\theta = \frac{1+\cos 2\theta}{2}$

$L = \sin^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$

$\Rightarrow L = \left(\frac{1-\cos\left(\frac{\pi}{8}\right)}{2}\right) - \left(\frac{1-\cos\left(\frac{\pi}{4}\right)}{2}\right)$

$\Rightarrow L = \frac{1}{2}\left(\cos\left(\frac{\pi}{4}\right) - \cos\left(\frac{\pi}{8}\right)\right)$

$\Rightarrow L = \frac{1}{2\sqrt{2}} - \frac{1}{2}\cos\left(\frac{\pi}{8}\right)$

$M = \cos^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$

$\Rightarrow M = \left(\frac{1+\cos\left(\frac{\pi}{8}\right)}{2}\right) - \left(\frac{1-\cos\left(\frac{\pi}{4}\right)}{2}\right)$

$\Rightarrow M = \frac{1}{2\sqrt{2}} + \frac{1}{2}\cos\frac{\pi}{8}$