

Definition: The average value of a periodic function which has a range from 0 to 2π is defined as

$$\langle f \rangle = \frac{1}{2\pi} \int_0^{2\pi} f(\theta) d\theta.$$

Determine $\langle \cos^2 \theta \rangle$

A) $\langle \cos^2 \theta \rangle = 0$

B) $\langle \cos^2 \theta \rangle = \frac{1}{2}$

C) $\langle \cos^2 \theta \rangle = 1$

$$\begin{aligned}\cos^2 \theta &= \frac{1 + \cos 2\theta}{2}, \\ \langle 1 \rangle &= 1, \\ \langle \cos \theta \rangle &= 0, \\ \langle \cos 2\theta \rangle &= 0.\end{aligned}$$

Therefore, $\langle \cos^2 \theta \rangle = \left\langle \frac{1}{2} \right\rangle + \left\langle \frac{\cos 2\theta}{2} \right\rangle = \frac{1}{2} + 0 = \frac{1}{2}$.

Answer **B**.

34.03-01 Rms Value of Cos Theta 2004-3-24