

Trigonometry Functions - Class XI

Past Year JEE Questions

Questions

Question: 01

$$\text{If } \frac{\sqrt{2} \sin \alpha}{\sqrt{1+\cos 2\alpha}} = \frac{1}{7} \text{ and } \sqrt{\frac{1-\cos 2\beta}{2}} = \frac{1}{\sqrt{10}}$$

$\alpha, \beta \in (0, \frac{\pi}{2})$ then $\tan(\alpha + 2\beta)$ is equal to _____.

Solutions

Solution: 01

Answer

Correct Answer is **1**

Explanation

$$\frac{\sqrt{2} \sin \alpha}{\sqrt{1+\cos 2\alpha}} = \frac{1}{7}$$

$$\Rightarrow \frac{\sqrt{2} \sin \alpha}{\sqrt{2 \cos^2 \alpha}} = \frac{1}{7}$$

$$\Rightarrow \frac{\sqrt{2} \sin \alpha}{\sqrt{2} \cos \alpha} = \frac{1}{7}$$

$$\Rightarrow \tan \alpha = \frac{1}{7}$$

$$\text{Also given } \sqrt{\frac{1-\cos 2\beta}{2}} = \frac{1}{\sqrt{10}}$$

$$\Rightarrow \frac{\sqrt{2} \sin \beta}{\sqrt{2}} = \frac{1}{\sqrt{10}}$$

$$\Rightarrow \sin \beta = \frac{1}{\sqrt{10}}$$

$$\therefore \tan \beta = \frac{1}{3}$$

$$\tan 2\beta = \frac{2 \tan \beta}{1 - \tan^2 \beta}$$

$$= \frac{2(\frac{1}{3})}{1 - \frac{1}{9}} = \frac{3}{4}$$

$$\therefore \tan(\alpha + 2\beta) = \frac{\tan \alpha + \tan 2\beta}{1 - \tan \alpha \cdot \tan 2\beta}$$

$$= \frac{\frac{1}{7} + \frac{3}{4}}{1 - \frac{1}{7} \cdot \frac{3}{4}}$$

$$= \frac{\frac{25}{28}}{\frac{25}{28}} = 1$$