Trigonometric Equations Ex 11.1 Q4(vi)

We have,

$$\cos\theta.\ \cos 2\theta.\ \cos 3\theta = \frac{1}{4}$$

$$\Rightarrow \quad 2\cos\theta\,.\cos 3\theta.\cos 2\theta = \frac{1}{2}$$

$$\Rightarrow \quad \left(\cos 4\theta + \cos 2\theta\right)\cos 2\theta = \frac{1}{2}$$

$$\Rightarrow \quad \left(2\cos^2 2\theta - 1 + \cos 2\theta\right)\cos 2\theta = \frac{1}{2}$$

$$\Rightarrow \quad 2\cos^3 2\theta + \cos^2 2\theta - \cos 2\theta = \frac{1}{2}$$

$$\Rightarrow \quad 4\cos^2 2\theta + 2\cos^2 2\theta - 2\cos 2\theta - 1 = 0$$

$$\Rightarrow \quad 2\cos^2 2\theta\left(2\cos\theta + 1\right) - 1\left(2\cos 2\theta + 1\right) = 0$$

$$\Rightarrow \quad \left(2\cos^2 2\theta - 1\right)\left(2\cos 2\theta + 1\right) = 0$$

either

$$2\cos^2 2\theta - 1 = 0 \qquad \text{or} \quad \Rightarrow \quad 2\cos 2\theta + 1 = 0$$

$$\Rightarrow \quad \cos 4\theta = 0 \qquad \text{or} \quad \Rightarrow \quad \cos 2\theta = -\frac{1}{2}$$

$$\Rightarrow \quad 4\theta = \left(2n+1\right)\frac{\pi}{2} \qquad \text{or} \quad \Rightarrow \quad \cos 2\theta = \cos 2\frac{\pi}{3}$$

$$\Rightarrow \quad \theta = \left(2n+1\right)\frac{\pi}{8} \qquad \text{or} \quad \Rightarrow \quad 2\theta = 2m\pi \pm 2\frac{\pi}{3}$$

$$\Rightarrow \theta = m\pi \pm \frac{\pi}{3}$$

Thus,

$$\theta = \left(2n+1\right)\frac{\pi}{8} \qquad \text{or } \theta = m\pi \pm \frac{\pi}{3}, m, n \in z$$

Trigonometric Equations Ex 11.1 Q4(v)

We have,

$$\cos\theta + \sin\theta = \cos 2\theta + \sin 2\theta$$

$$\Rightarrow \quad \cos\theta - \cos 2\theta = \sin 2\theta - \sin\theta$$

$$\Rightarrow \quad 2\sin\frac{3\theta}{2}.\sin\frac{\theta}{2} = 2\cos\frac{3\theta}{2}.\sin\frac{\theta}{2}$$

$$\Rightarrow \quad 2\sin\frac{\theta}{2}\left(\sin\frac{3\theta}{2} - \cos\frac{3\theta}{2}\right) = 0$$

$$\Rightarrow \quad 2\sin\frac{\theta}{2}\left(\sin\frac{3\theta}{2} - \cos\frac{3\theta}{2} = 0\right)$$

either

$$\sin\frac{\theta}{2} = 0 \qquad \text{or} \quad \sin\frac{3\theta}{2} - \cos\frac{3\theta}{2} = 0$$

$$\Rightarrow \quad \frac{\theta}{2} = n\pi, n \in \qquad \text{or} \quad \tan\frac{3\theta}{2} = 1 = \tan\frac{\pi}{4}$$

$$\Rightarrow \quad \theta = 2n\pi, n \in z \quad \text{or} \quad \frac{3\theta}{2} = n\pi + \frac{\pi}{4}$$

$$\text{or} \quad \theta = 2n\frac{\pi}{3} + \frac{\pi}{3.2}, n \in z$$

Thus,

$$\Rightarrow \quad \theta = 2n\pi \qquad \text{or} \quad 2n\frac{\pi}{3} + \frac{\pi}{6}, n \in$$

Trigonometric Equations Ex 11.1 Q4(vi)

We have,

$$\sin\theta + \sin 2\theta + \sin 3\theta = 0$$

$\Rightarrow \quad \sin 2\theta + 2\sin 2\theta.\cos\theta = 0$

$\Rightarrow \quad \sin 2\theta + (1 + 2\cos\theta) = 0$

$\Rightarrow \quad$ either

$\sin 2\theta = 0 \quad$ or $\quad 1 + 2\cos\theta = 0$

$\Rightarrow \quad 2\theta = n\pi, n \in z \quad$ or $\quad \cos\theta = -\frac{1}{2} = \cos\left(\pi - \frac{\pi}{3}\right)$

$\Rightarrow \quad \theta = \frac{n\pi}{2}, n \in z \quad$ or $\quad \theta = 2m\pi \pm \frac{2\pi}{3}, m \in z$

Thus,

$$\theta = \frac{n\pi}{2}, n \in z \quad \text{or} \quad \theta = 2m\pi \pm \frac{2\pi}{3}, m \in z$$

Trigonometric Equations Ex 11.1 Q4(vii)

Given , $\sin x + \sin 2x + \sin 3x + \sin 4x = 0$

$(\sin 4x + \sin 2x) + (\sin 3x + \sin x) = 0$

Using , (sinA +sinB) formula =>

$$2\sin\left[\frac{(4x+2x)}{2}\right]\cos\left[\frac{4x-2x}{2}\right] + 2\sin\left[\frac{(3x+x)}{2}\right]\cos\left[\frac{(3x-x)}{2}\right] = 0$$

$$2\sin 3x\cos x + 2\sin 2x\cos x = 0$$

$$2\cos x(\sin 3x + \sin 2x) = 0$$

$$2\cos x\left(2\sin\left[\frac{(3x+2x)}{2}\right]\cos\left[\frac{(3x-2x)}{2}\right]\right) = 0$$

$$4\cos x\sin\frac{5x}{2}\cos\frac{x}{2} = 0$$

$$\cos x = 0 ; \sin\frac{5x}{2} = 0 ; \cos\frac{x}{2} = 0$$

$$x = \frac{(2n+1)\pi}{2} ; \frac{5x}{2} = m\pi ; \frac{x}{2} = \frac{(2r+1)\pi}{2}$$

$$x = \frac{(2n+1)\pi}{2} ; x = \frac{2m\pi}{5} ; x = (2r+1)\pi, m, r, n \in Z$$

*********** END **********