



Question 11:

$$\begin{aligned}\sec 4A &= \operatorname{cosec}(A - 15^\circ) \\ \Rightarrow \operatorname{cosec}(90^\circ - 4A) &= \operatorname{cosec}(A - 15^\circ) \\ \therefore 90^\circ - 4A &= A - 15^\circ \text{ or } 5A = 90^\circ + 15^\circ = 105^\circ \\ \text{Hence, } A &= \frac{105^\circ}{5} = 21^\circ\end{aligned}$$

Question 12:

$$\therefore \tan \frac{B+C}{2} = \tan \frac{180-A}{2} = \tan \left( 90^\circ - \frac{A}{2} \right) = \cot \frac{A}{2}$$

Question 13:

$$\begin{aligned}& \frac{\sin 15^\circ \cos 75^\circ + \cos 15^\circ \sin 75^\circ}{\tan 5^\circ \tan 30^\circ \tan 35^\circ \tan 55^\circ \tan 85^\circ} \\ &= \frac{\sin 15^\circ \cos (90^\circ - 15^\circ) + \cos 15^\circ \sin (90^\circ - 15^\circ)}{\tan 5^\circ \tan 30^\circ \tan 35^\circ \tan (90^\circ - 35^\circ) \tan (90^\circ - 5^\circ)} \\ &= \frac{\sin 15^\circ \sin 15^\circ + \cos 15^\circ \cos 15^\circ}{\tan 5^\circ \tan 30^\circ \tan 35^\circ \cot 35^\circ \cot 5^\circ} \\ &= \frac{\sin^2 15^\circ + \cos^2 15^\circ}{(\tan 5^\circ \cot 5^\circ)(\tan 35^\circ \cot 35^\circ) \tan 30^\circ} \\ &= \frac{1}{\left( \tan 5^\circ \times \frac{1}{\tan 5^\circ} \right) \left( \tan 35^\circ \times \frac{1}{\tan 35^\circ} \right) \tan 30^\circ} \\ &= \frac{1}{1 \times 1 \times \frac{1}{\sqrt{3}}} = \sqrt{3}\end{aligned}$$

Question 14:

$$\begin{aligned}& \frac{3 \cos 55^\circ}{7 \sin 35^\circ} - \frac{4(\cos 70^\circ \operatorname{cosec} 20^\circ)}{7(\tan 5^\circ \tan 25^\circ \tan 45^\circ \tan 65^\circ \tan 85^\circ)} \\ &= \frac{3 \cos (90^\circ - 35^\circ)}{7 \sin 35^\circ} - \frac{4 \cos 70^\circ \operatorname{cosec} (90^\circ - 70^\circ)}{7 \tan 5^\circ \tan 25^\circ \tan 45^\circ \tan (90^\circ - 25^\circ) \tan (90^\circ - 5^\circ)} \\ &= \frac{3 \sin 35^\circ}{7 \sin 35^\circ} - \frac{4 \cos 70^\circ \sec 70^\circ}{7 \tan 5^\circ \tan 25^\circ \tan 45^\circ \cot 25^\circ \cot 5^\circ} \\ &= \frac{3}{7} - \frac{4}{7 \left( \tan 5^\circ \times \frac{1}{\tan 5^\circ} \right) \left( \tan 25^\circ \times \frac{1}{\tan 25^\circ} \right) \times 1} = \frac{3}{7} - \frac{4}{7} = -\frac{1}{7}\end{aligned}$$

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