Question 9:
On substituting the value of various T-ratios, we get

$$\frac{\sin 30^\circ}{\cos 45^\circ} + \frac{\cot 45^\circ}{\sec 60^\circ} - \frac{\sin 60^\circ}{\tan 45^\circ} - \frac{\cos 30^\circ}{\sin 90^\circ}$$

$$= \frac{\left(\frac{1}{2}\right)}{\left(\frac{1}{\sqrt{2}}\right)} + \frac{1}{\left(\frac{2}{1}\right)} - \frac{\left(\frac{\sqrt{3}}{2}\right)}{1} - \frac{\left(\frac{\sqrt{3}}{2}\right)}{1}$$

$$= \frac{\sqrt{2}}{2} + \frac{1}{2} - \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} = \frac{\sqrt{2} + 1 - \sqrt{3} - \sqrt{3}}{2}$$

$$= \left(\frac{\sqrt{2} + 1 - 2\sqrt{3}}{2}\right)$$

Question 10:

$$\text{L.H.S.} = \frac{1-\sin 60^\circ}{\cos 60^\circ} = \frac{1-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{2-\sqrt{3}}{1}$$

$$\text{R.H.S.} = \frac{\tan 60^\circ - 1}{\tan 60^\circ + 1} = \frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$= \frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}\right)^2 - (1)^2}$$

$$= \frac{3+1-2\sqrt{3}}{3-1}$$

$$= \frac{4-2\sqrt{3}}{2}$$

$$= \frac{2\left(2-\sqrt{3}\right)}{2}$$

$$= \left(2-\sqrt{3}\right)$$

L.H.S. = R.H.S.

Hence, $\frac{1-\sin 60^\circ}{\cos 60^\circ} = \frac{\tan 60^\circ - 1}{\tan 60^\circ + 1}$

(ii)

$$\text{L.H.S.} = \frac{\cos 30^\circ + \sin 60^\circ}{1 + \sin 30^\circ + \cos 60^\circ} = \frac{\frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2}}{1 + \frac{1}{2} + \frac{1}{2}} = \frac{\sqrt{3}}{2}$$

$$\text{R.H.S.} = \cos 30^\circ = \frac{\sqrt{3}}{2}$$

L.H.S = R.H.S.

$$\text{hence, } \frac{\cos 30^\circ + \sin 60^\circ}{1 + \sin 30^\circ + \cos 60^\circ} = \cos 30^\circ$$

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