To apply part (i) it is necessary to check that the left-hand factor satisfies the skew-symmetry condition. From the skew-symmetry of the connection forms

$$(\mathcal{L}_X\omega_a^d)\delta_{db} + (\mathcal{L}_X\omega_b^d)\delta_{ad} = 0$$

and from the skew-symmetry of the ξ_b^a

$$(d\xi_a^d)\delta_{db} + (d\xi_b^d)\delta_{ad} = 0.$$

Finally

$$\begin{aligned}
&(\omega_c^d\xi_a^c - \xi_c^d\omega_a^c)\delta_{db} + (\omega_c^d\xi_b^c - \xi_c^d\omega_b^c)\delta_{ad} \\
&\qquad = -\omega_b^d\xi_a^c\delta_{cd} + \xi_b^d\omega_a^c\delta_{cd} - \omega_a^d\xi_b^c\delta_{dc} + \xi_a^d\omega_b^c\delta_{dc} \\
&\qquad = -\omega_b^d\xi_a^c\delta_{cd} + \xi_b^d\omega_a^c\delta_{cd} - \omega_a^c\xi_b^d\delta_{cd} + \xi_a^c\omega_b^d\delta_{cd} \\
&\qquad = 0.
\end{aligned}$$

Thus by part (i)

$$\mathcal{L}_X\omega_b^a + d\xi_b^a + \omega_c^a\xi_b^c - \xi_c^a\omega_b^c = 0.$$