9. $\mathbf{B}=(\mathbf{I}+\mathbf{A})(\mathbf{I}-\mathbf{A})^{-1} \Rightarrow \mathbf{B}^{\mathbf{T}} = \left((\mathbf{I}-\mathbf{A})^{-1}\right)^{\mathbf{T}}(\mathbf{I}+\mathbf{A})^{\mathbf{T}} = \left(\mathbf{I}-\mathbf{A}^{\mathbf{T}}\right)^{-1}(\mathbf{I}+\mathbf{A})^{\mathbf{T}}$ $\left[\left(\mathbf{A}^{-1}\right)^{\mathbf{T}} = \left(\mathbf{A}^{\mathbf{T}}\right)^{-1}\right]$
hence, $\mathbf{B}^{\mathbf{T}}\mathbf{B} = \left(\mathbf{I}-\mathbf{A}^{\mathbf{T}}\right)^{-1}(\mathbf{I}+\mathbf{A})^{\mathbf{T}}(\mathbf{I}+\mathbf{A})(\mathbf{I}-\mathbf{A})^{-1} = \mathrm{I}$ iff
$(\mathbf{I}+\mathbf{A})^{\mathbf{T}}(\mathbf{I}+\mathbf{A}) = \left(\mathbf{I}-\mathbf{A}^{\mathbf{T}}\right)(\mathbf{I}-\mathbf{A})$ by pre and post multiplying by inverses
i.e. iff $\left(\mathbf{I}+\mathbf{A}^{\mathbf{T}}\right)(\mathbf{I}+\mathbf{A}) = \left(\mathbf{I}-\mathbf{A}^{\mathbf{T}}\right)(\mathbf{I}-\mathbf{A})$ expanding gives $\mathbf{I}+\mathbf{A}+\mathbf{A}^{\mathbf{T}}+\mathbf{A}^{\mathbf{T}}\mathbf{A} = \mathbf{I}-\mathbf{A}-\mathbf{A}^{\mathbf{T}}+\mathbf{A}^{\mathbf{T}}\mathbf{A}$
$\Rightarrow \mathbf{A}+\mathbf{A}^{\mathbf{T}} = -\mathbf{A}-\mathbf{A}^{\mathbf{T}} \Rightarrow 2\left(\mathbf{A}+\mathbf{A}^{\mathbf{T}}\right) = \mathbf{0}$ or $\mathbf{A}+\mathbf{A}^{\mathbf{T}} = \mathbf{0}$ as required.
