$$
\begin{bmatrix}
\frac{\partial R_k}{\partial \ddot{q}_k} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial S_k}{\partial \ddot{q}_k} & \frac{\partial S_k}{\partial \dot{q}_k} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial T_k}{\partial q_k} & \frac{\partial T_k}{\partial q_k} & \frac{\partial T_k}{\partial q_k} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial R_{k+1}}{\partial \ddot{q}_{k+1}} & \frac{\partial R_{k+1}}{\partial \ddot{q}_{k+1}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial R_{k+1}}{\partial \ddot{q}_{k+1}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial S_{k+1}}{\partial \ddot{q}_{k+1}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial S_{k+1}}{\partial \dot{q}_{k+1}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial T_{k+1}}{\partial q_{k+1}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+1}}{\partial q_{k+1}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial R_{k+2}}{\partial \ddot{q}_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial R_{k+2}}{\partial \ddot{q}_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial S_{k+2}}{\partial \ddot{q}_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} \\[8pt]
\frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}} & \frac{\partial T_{k+2}}{\partial q_{k+2}}
\end{bmatrix}
$$