

$$\left[\begin{array}{cccccccc} +\beta h^2 \frac{\partial R_k}{\partial q_k} & \gamma h & \beta h^2 & \frac{\partial R_{k+1}}{\partial \ddot{q}_k} & (1-\gamma)h & \frac{1-2\beta}{2}h^2 & & \\ & -1 & & \frac{\partial R_{k+1}}{\partial \dot{q}_k} & 1 & h & & \\ & & -1 & \frac{\partial R_{k+1}}{\partial q_k} & & 1 & & \\ & & & \left[\frac{\partial R_{k+1}}{\partial \ddot{q}_{k+1}} + \gamma h \frac{\partial R_{k+1}}{\partial \dot{q}_{k+1}} + \beta h^2 \frac{\partial R_{k+1}}{\partial q_{k+1}} \right] & \gamma h & \beta h^2 & \frac{\partial R_{k+2}}{\partial \ddot{q}_{k+1}} & (1-\gamma)h & \frac{1-2\beta}{h} \\ & & & & -1 & & \frac{\partial R_{k+2}}{\partial \dot{q}_{k+1}} & 1 & h \\ & & & & & -1 & \frac{\partial R_{k+2}}{\partial q_{k+1}} & & 1 \\ & & & & & & \left[\frac{\partial R_{k+2}}{\partial \ddot{q}_{k+2}} + \gamma h \frac{\partial R_{k+2}}{\partial \dot{q}_{k+2}} + \beta h^2 \frac{\partial R_{k+2}}{\partial q_{k+2}} \right] & \gamma h & \beta h^2 \\ & & & & & & & -1 & \\ & & & & & & & & -1 \end{array} \right]$$