7-4

$$
\begin{aligned}
G_{t\,t+n} &= R_{t+1} + \gamma R_{t+2} + \cdots + \gamma^{n-1} R_{t+n} + \gamma^n Q_{t+n-1}(S_{t+n}, A_{t+n}) \\
&= R_{t+1} + \gamma Q(S_{t+1}, A_{t+1}) - \gamma Q_t(S_{t+1}, A_{t+1}) - Q_{t-1}(S_t, A_t) + Q_{t-1}(S_t, A_t) \\
&+ \gamma R_{t+2} + \gamma^2 Q_{t+1}(S_{t+2}, A_{t+2}) - \gamma^2 Q_{t+1}(S_{t+2}, At+2) - \gamma Q_t(S_{t+1}, A_{t+1}) + \gamma Q_t(S_{t+1}, A_{t+1}) \\
&+ \dots \\
&+ \gamma^{n-1} R_{t+n} + \gamma^n Q_{t+n-1}(S_{t+n}, A_{t+n}) - \gamma^n Q_{t+n-1}(S_{t+n}, A_{t+n}) \\
&- \gamma^{n-1} Q_{t+n-2}(S_{t+n-1}, A_{t+n-1}) + \gamma^{n-1} Q_{t+n-2}(S_{t+n-1}, A_{t+n-1}) \\
&+ \gamma^n Q_{t+n-1}(S_{t+n}, A_{t+n}) \\
&= Q_{t-1}(S_t, A_t) + \sum_{k=t}^{\min(t+n,T)-1} \gamma^{k-t} \left[R_{k+1} + \gamma Q_k(S_{k+1}, A_{k+1}) - Q_{k-1}(S_k, A_k) \right]
\end{aligned}
$$