Discretization of a 1st order ODE

$$\frac{dR}{dt} = \frac{R}{\tau} + \omega^2 S$$

$$R(t) = R(0)e^{\frac{t}{\tau}} + \int_{l=0}^{l=t} \omega^2 e^{\frac{t-l}{\tau}} S(l)dl$$

$$R(t_{n+1}) = R(t_n)e^{\frac{\Delta T}{\tau}} + \int_{l=t_n}^{l=t_{n+1}} \omega^2 e^{\frac{t_{n+1}-l}{\tau}} S(l)dl$$

$$R(t_{n+1}) = R(t_n)\underbrace{e^{\frac{\Delta T}{\tau}}}_{\alpha} + \bar{S}(t_n)\underbrace{\int_{l=t_n}^{l=t_{n+1}} \omega^2 e^{\frac{t_{n+1}-l}{\tau}} dl}_{\beta}$$