(a) Write down the Convolution Integral and briefly explain what it does and why it works.

(b) A linear system has an impulse response $g(t)$. Show that the unit step response of such a system is given by:

$$y(t) = \int_{0}^{t} g(\tau) d\tau$$
(c) A finite duration integrator can be modelled by the impulse response given by:
\[ g(t) = H(t) - H(t-a) \]
where \( H(t) \) corresponds to a step function.

(i) If the input to this system is given by
\[ r(t) = A \exp(-bt) H(t) \]
find an expression for the output of the system.

(ii) Demonstrate graphically that the result you obtain makes physical sense.