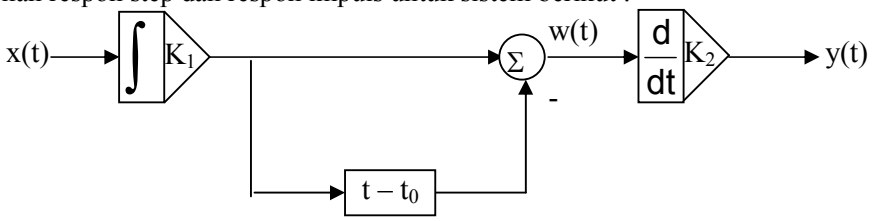
2.5. Respon Step

Respon step dari sistem linier adalah fungsi g(t) dengan $y(t) = x_0 g(t)$ adalah output untuk input $x_0 u(t)$. Hubungan antara respon impuls dan respon step

$$h(t) = \frac{dg(t)}{dt}$$

Contoh :

Carilah respon step dan respon impuls untuk sistem berikut :



Jawab :

$$w(t) = k_1 \int_{-\infty}^{t} x(t)dt - k_1 \int_{-\infty}^{t-t_0} x(t)dt$$

$$y(t) = k_2 \frac{dw(t)}{dt} = k_1 k_2 [x(t) - x(t - t_0)]$$

Untuk $x(t) = x_0 u(t)$

$$y(t) = k_1 k_2 x_0 [u(t) - u(t - t_0)] = k_1 k_2 x_0 r\left(\frac{t}{t_0}\right)$$

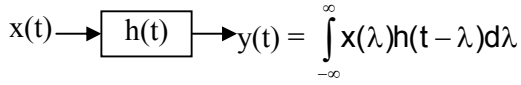
Respon step :

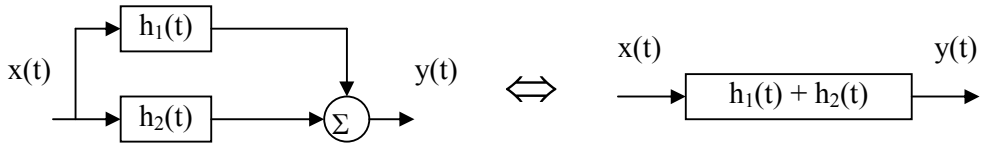
$$g(t) = \frac{y(t)}{x_0} = k_1 k_2 r\left(\frac{t}{t_0}\right)$$

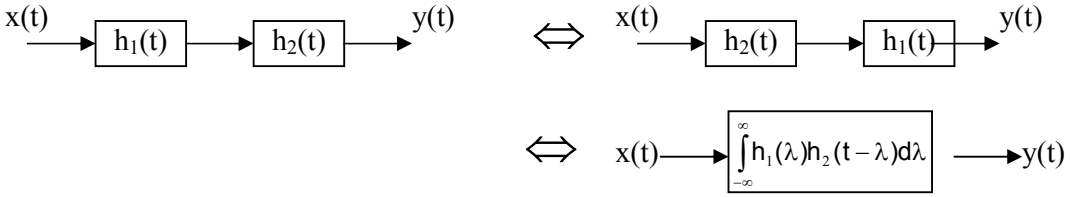
Respon impuls

$$h(t) = \frac{dg(t)}{dt} = k_1 k_2 \left(\delta(t) - \delta(t - t_0)\right)$$

2.6. Sifat-Sifat Respon Impuls Dalam Diagram Blok

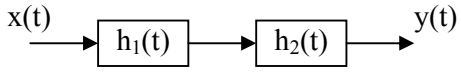






Contoh :

Carilah respon impuls untuk sistem :



dengan

$$h_1(t) = \frac{1}{\tau_1} e^{-t/\tau_1} u(t)$$

$$h_2(t) = \frac{1}{\tau_2} u(t)$$

Jawab :

$$h(t) = \int_{-\infty}^{\infty} h_1(\lambda) h_2(t-\lambda) d\lambda = \frac{1}{\tau_1 \tau_2} \int_{-\infty}^{\infty} e^{-\lambda/\tau_1} u(\lambda) u(t-\lambda) d\lambda$$

$$= \frac{1}{\tau_2} \left(1 - e^{-t/\tau_1}\right) u(t)$$