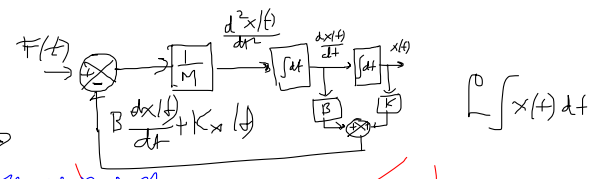
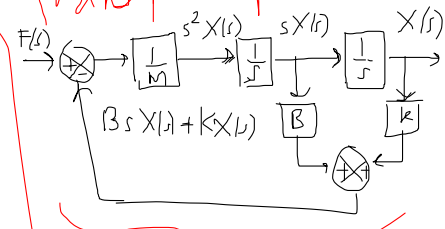


* Bagan Kotalic

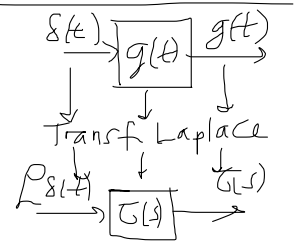
$$\frac{d^2x(t)}{dt^2} = \frac{1}{M} \left[F(t) - \left(B \frac{dx(t)}{dt} + Kx(t) \right) \right] \rightarrow$$



Transf. Laplace



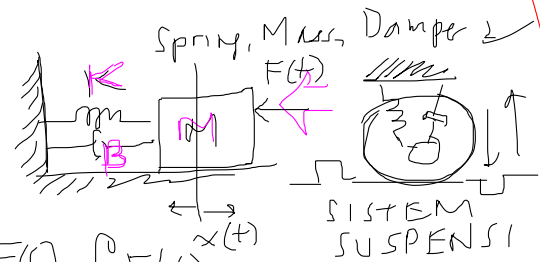
* Contoh Matematis : Tentukan $\mathcal{L}\{\delta(t)\}$! $\rightarrow \mathcal{L}\{\delta(t)\} = 1$



$$G(s) = G(s) \mathcal{L}\{\delta(t)\}$$

$$\mathcal{L}\{\delta(t)\} = \frac{G(s)}{G(s)} = 1$$

* Contoh Mekanik :



$$G(s) = ???$$

$$F(s) = \mathcal{L}\{F(t)\}$$

$$X(s) = \mathcal{L}\{x(t)\}$$

* Pers. Diferensial

$$F(t) = M \frac{d^2x(t)}{dt^2} + B \frac{dx(t)}{dt} + Kx(t)$$

$$F(s) = \mathcal{L}\{F(t)\} = \mathcal{L}\left[M \frac{d^2x(t)}{dt^2} + B \frac{dx(t)}{dt} + Kx(t)\right]$$

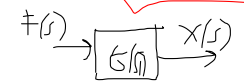
$$= \mathcal{L}\left[M \frac{d^2x(t)}{dt^2}\right] + \mathcal{L}\left[B \frac{dx(t)}{dt}\right] + \mathcal{L}\{Kx(t)\}$$

$$= M \mathcal{L}\left[\frac{d^2x(t)}{dt^2}\right] + B \mathcal{L}\left[\frac{dx(t)}{dt}\right] + K \mathcal{L}\{x(t)\}$$

$$= Ms^2X(s) + BsX(s) + KX(s)$$

$$= [Ms^2 + Bs + K]X(s)$$

$$G(s) = \frac{X(s)}{F(s)} = \frac{X(s)}{[Ms^2 + Bs + K]X(s)} = \frac{1}{Ms^2 + Bs + K}$$



$$s^2X(s) = \frac{1}{M} [F(s) - (BsX(s) + KX(s))]$$

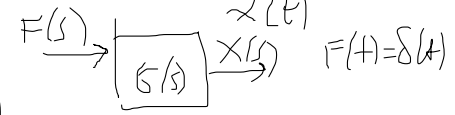
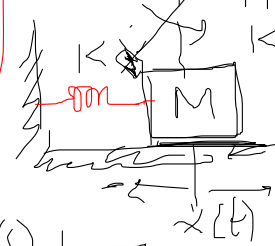
$$F(s) = Ms^2X(s) + BsX(s) + KX(s)$$

$$= [Ms^2 + Bs + K]X(s)$$

$$G(s) = \frac{X(s)}{F(s)} = \frac{1}{Ms^2 + Bs + K}$$

Contoh :

Diketahui:
 $M = 1 \text{ kg}$
 $K = 4 \text{ N/m}$
 $x(t) = ?$



$$F(s) = \mathcal{L}\{F(t)\} = \mathcal{L}\{\delta(t)\} = 1$$

$$X(s) = G(s)F(s)$$

$$= G(s)$$

$$G(s) = \frac{1}{Ms^2 + K}$$

$$= \frac{1}{s^2 + 4}$$

$$G(s) = \frac{1}{s^2 + 4}$$

$$X(s) = G(s)$$

$$= \frac{1}{s^2 + 4}$$

$$x(t) = \mathcal{L}^{-1}\left\{\frac{1}{s^2 + 4}\right\}$$

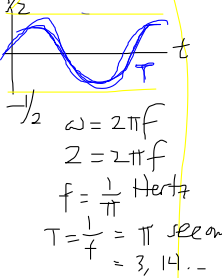
$$= \mathcal{L}^{-1}\left\{\frac{1}{\omega^2} \frac{\omega}{s^2 + \omega^2}\right\}$$

(buku ke 6, Table 4.1. hal 60)

$$= \frac{1}{\omega} \mathcal{L}^{-1}\left\{\frac{\omega}{s^2 + \omega^2}\right\}$$

$$\omega = 2 \text{ rad/sec}$$

$$x(t) = \frac{1}{2} \sin 2t$$



RVMT