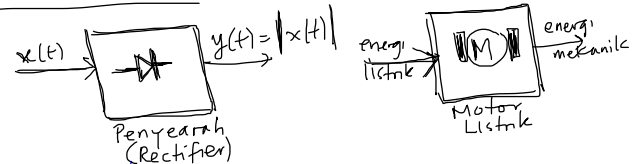


*** Representasi PROSES/SISTEM**
 Dalam Bagan Kotak, **SISTEM/PROSES** di-representasi -kan dgn **KOTAK**
 Kotak **TIDAK** mengawar barik Bentuk Fisik
 segit empat
 bujur sangkar
 4 p. l. panjang
 lingkaran sistem
 isyarat INPUT masuk-an 'disturbance' (gangguan)
 internal eksistensial
 isyarat OUTPUT keluar-an 'noise' (derau)

*** Notasi Sistem**
 * Kata & kalimat
 * Huruf dan angka
 $x(t) \rightarrow \int dt \rightarrow y(t) = \int x(t) dt$ integrator
 $x \rightarrow K \rightarrow y = Kx$
 $K > 1 \rightarrow$ Penguat / Amplifier
 $0 < K < 1 \rightarrow$ Redaman / Attenuator
 $K < 0 \rightarrow$ Penguat membalik (inverting amplifier)

*** Operasi matematik**
 $x(t) \rightarrow \frac{d}{dt} \rightarrow y(t) = \frac{dx(t)}{dt}$
 $x(t) \rightarrow \log|x(t)| \rightarrow y(t)$ log-amp
*** Simbol khusus**



*** Notasi Isyarat**
 * Berupa kata-kata/kalimat
 * Berupa fungsi
 $x(t)$ = isyarat x yang berubah dgn t
 $y(k)$ = isyarat y yang berubah dgn k = 0, 1, 2, 3, ...

*** Percabangan dan Pertemuan ISYARAT**

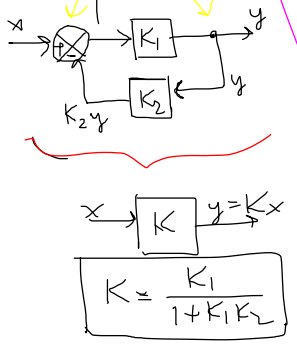
*** ALJABAR BAGAN KOTAK**
Block Diagram Algebra

*** Hubungan serial (cascado)**
 $x \rightarrow K_1 \rightarrow K_2 \rightarrow y$
 $y = K_2 K_1 x$
 $K = K_1 K_2$

*** Hubungan paralel**
 $x \rightarrow K_1 \rightarrow K_2 \rightarrow y$
 $y = K_1 x + K_2 x = (K_1 + K_2)x$
 $K = K_1 + K_2$

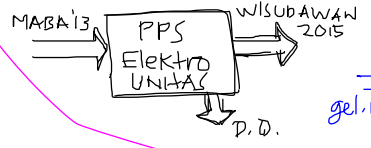
*** Hubungan umpan maju (feed forward)**
 $x \rightarrow K_1 \rightarrow y$
 $x \rightarrow K_2 \rightarrow y$
 $y = K_1 x + K_2 x = (K_1 + K_2)x$
 $K = K_1 + K_2$

*** Hubungan umpan-balik (feedback)**
 $y = K_1 [x - K_2 y]$
 $y = K_1 x - K_1 K_2 y$
 $y + K_1 K_2 y = K_1 x$
 $[1 + K_1 K_2] y = K_1 x$
 $y = \frac{K_1}{1 + K_1 K_2} x$

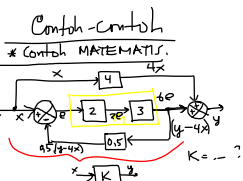
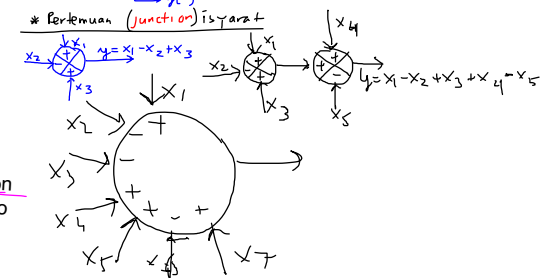


*** Representasi sistem**
 Dalam kuliah ini, sistem direpresentasikan dengan **BAGAN KOTAK (Block Diagram)**, suatu alat matematik untuk mem-visualisasi-sasi sistem
 Representasi isyarat (signal)
 Representasi proses atau sistem
*** Representasi isyarat (signal)**
 Dalam Bagan Kotak, isyarat direpresentasi kan dengan 'arah panah' yang ada **USUNG** dan **PANGKAL**-ny

*** Pengertian SISTEM**
 (Oppenheim, et al.)
 A system can be viewed as any process that results in the transformation of signals. Thus, a system has an input and an output which is related to the input through the system transformation.



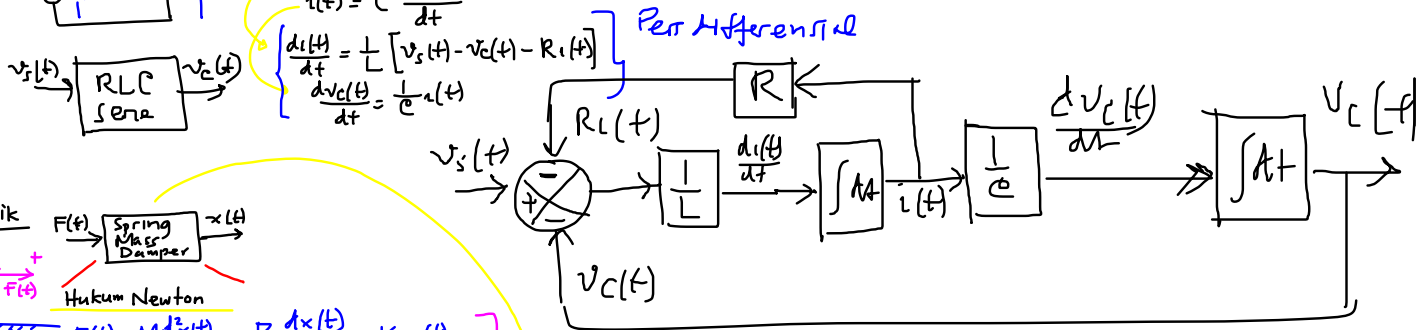
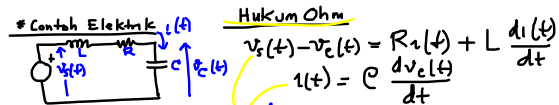
*** Percabangan (branching) isyarat**
 $x(t) \rightarrow y(t)$
 $x(t) \rightarrow y(t)$
 $x(t) \rightarrow y(t)$
 $x(t) \rightarrow y(t)$



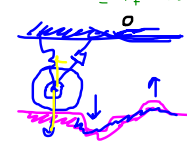
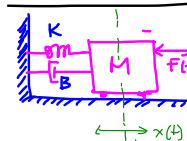
*** Contoh MATEMATIS**
 Contoh ALJABAR Bagan Kotak
 Hubungan serial
 $K_1 = 2 \times 3 = 6$
 Hubungan umpan-balik
 $K_2 = 1 + (6)(0.5) = 4$
 Hubungan umpan-balik
 $K = K_2 + 4 = 8$

*** Dengan Percabangan & Pertemuan Isyarat**
 $e = x - (0.5)(y - 4x)$
 $= x - (0.5y - 2x)$
 $= x - 0.5y + 2x = 3x - 0.5y$
 $6e = y - 4x$
 $6(3x - 0.5y) = y - 4x$
 $18x - 3y = y - 4x$
 $4y = 22x$
 $y = 5.5x$
K = 5.5

SAMA!



*** Contoh Mekanik**

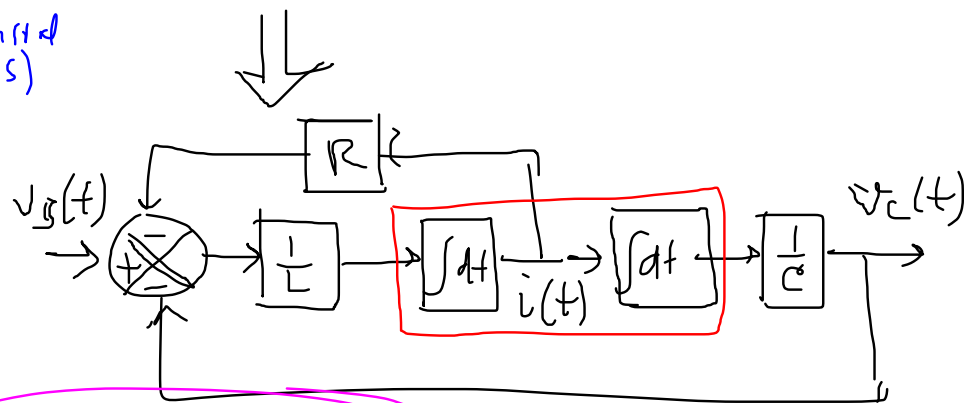
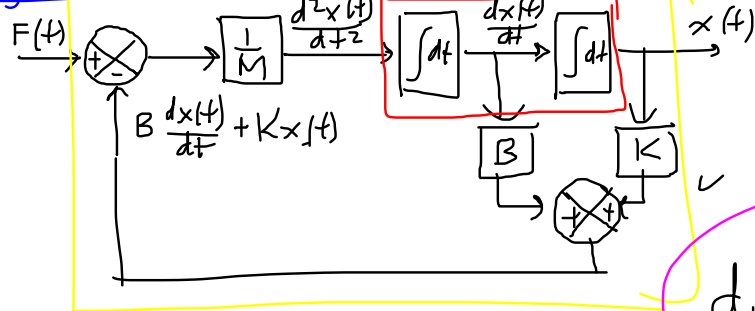


Pers Differensial (KALKULUS)

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

percepatan *kecepatan* *posisi*
gaya *gesekan* *sistem suspensi*

Bagan Blok



double integrator

next = *Matlab* *simulink*