Diagram Blok

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Disampaikan pada matakuliah **Dasar Sistem Kontrol**
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Diagram Blok

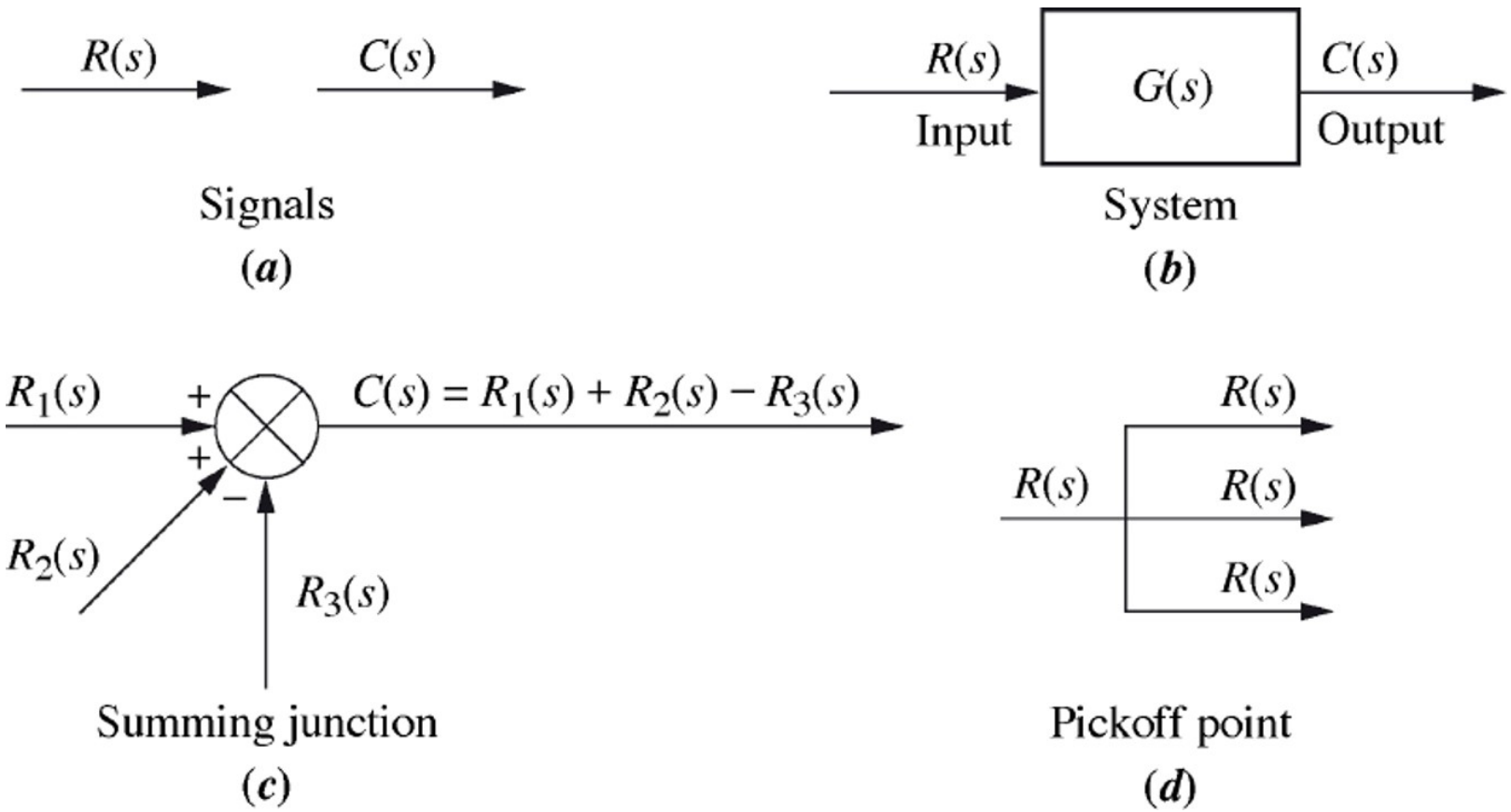
Definisi

Representasi dari beragam fungsi yang dilakukan oleh masing-masing komponen dan aliran sinyal.

Ketika kompleksitas sistem muncul, diagram blok yang menggambarkan sistem juga menjadi kompleks, jadi kita perlu metode untuk menyederhanakan diagram blok.

Elemen dari diagram blok adalah **blocks**, **signal**, **summing junctions** dan **pickoff points**.

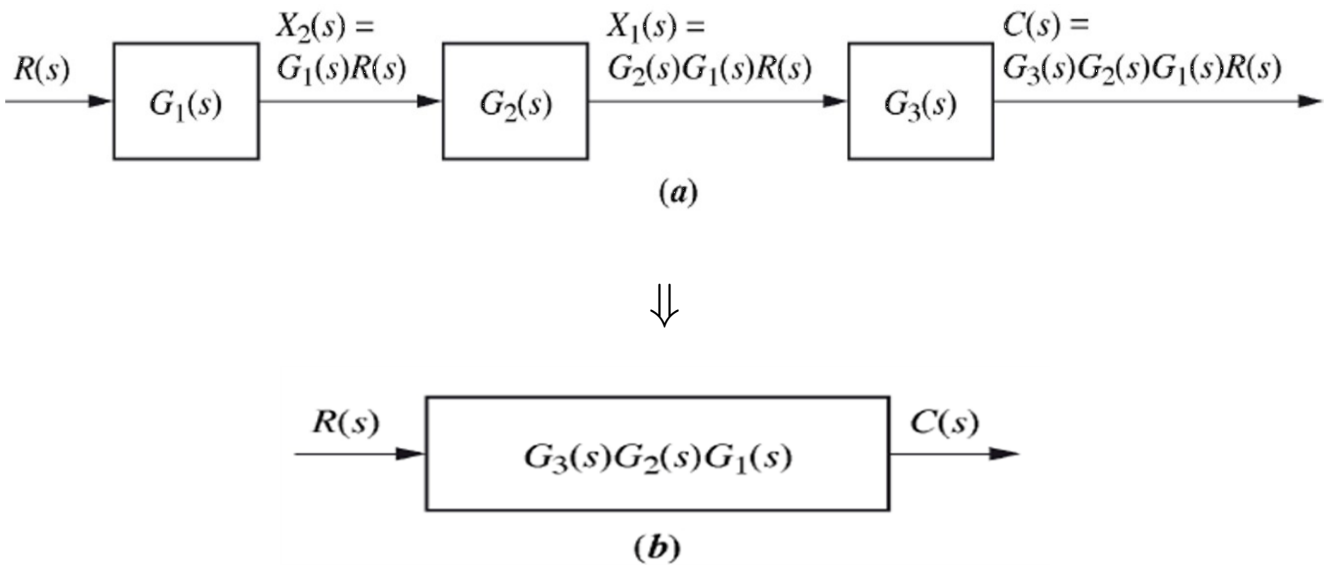
Elemen-elemen diagram blok



Interkoneksi subsistem

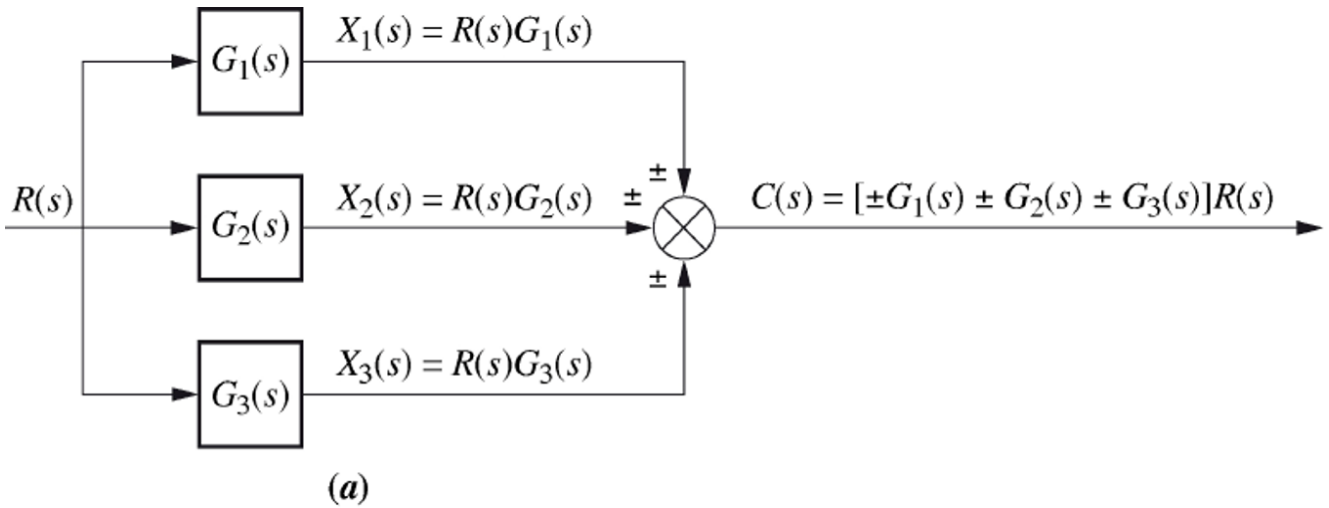
Bentuk-bentuk yang umum: **Seri (Cascade), Paralel (Parallel), Umpan Balik (Feedback)**.

- Seri

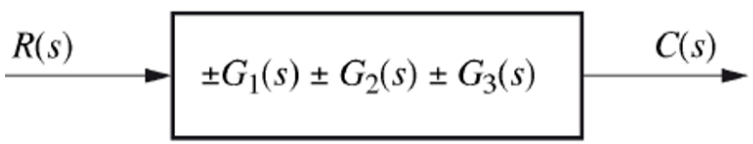


Interkoneksi subsistem

- Paralel



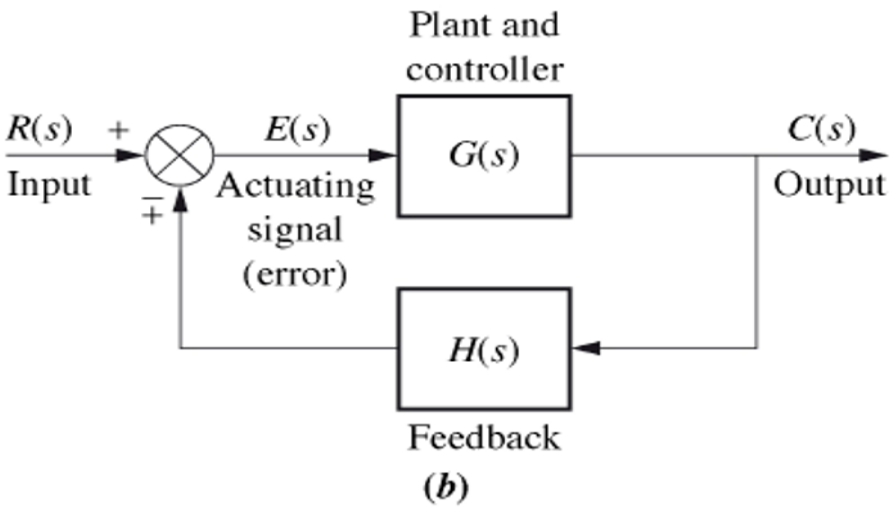
(a)



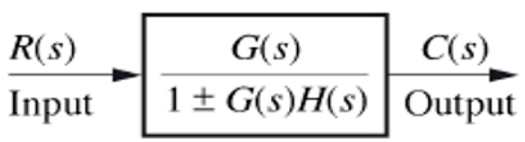
(b)

Interkoneksi subsistem

- Umpan balik



(b)



(c)

Interkoneksi subsistem (Umpan balik)

Dari diagram blok (b), kita dapatkan hubungan

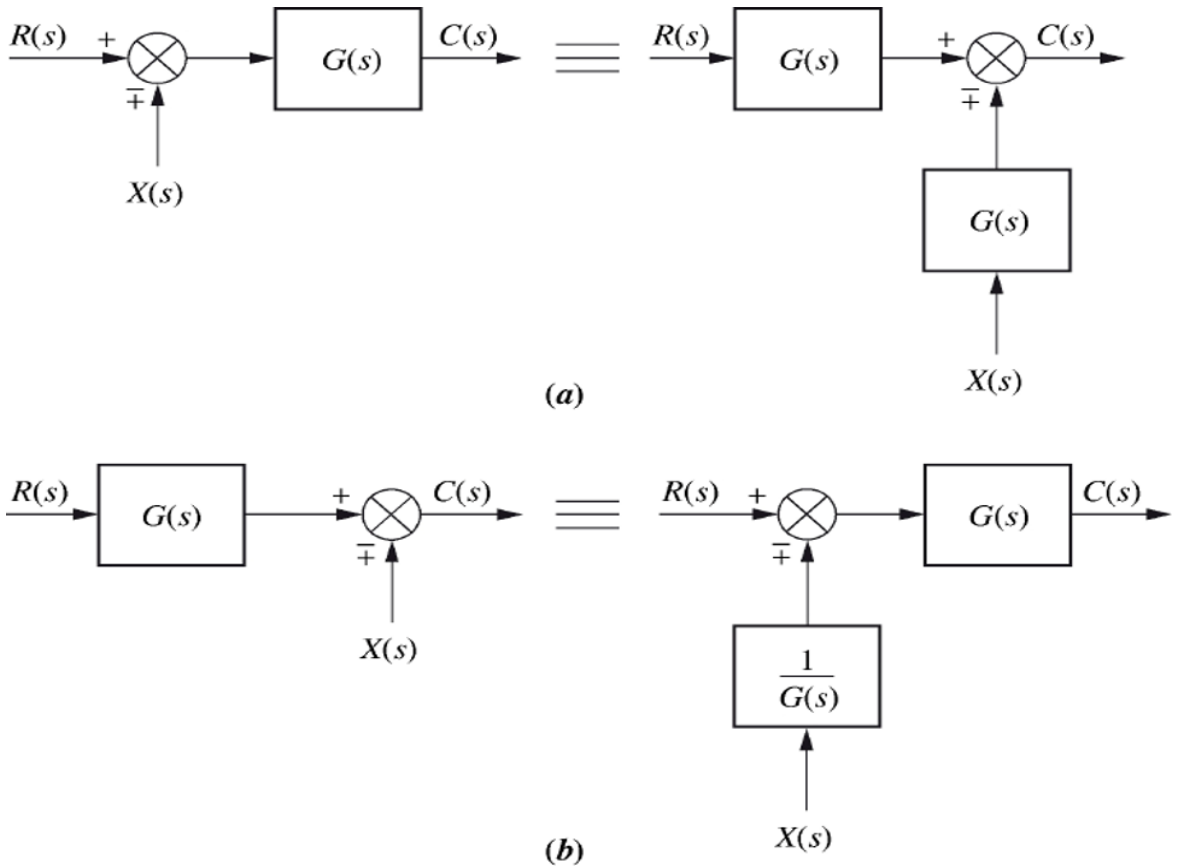
$$E(s) = R(s) \mp C(s)H(s) \tag{1}$$
$$C(s) = E(s)G(s) \tag{2}$$

substitusi (1) ke (2), maka

$$\begin{aligned} C(s) &= [R(s) \mp C(s)H(s)]G(s) \\ &= R(s)G(s) \mp C(s)H(s)G(s) \\ C(s) \pm C(s)H(s)G(s) &= R(s)G(s) \\ [1 \pm H(s)G(s)]C(s) &= R(s)G(s) \\ \frac{C(s)}{R(s)} &= \frac{G(s)}{1 \pm H(s)G(s)} \end{aligned}$$

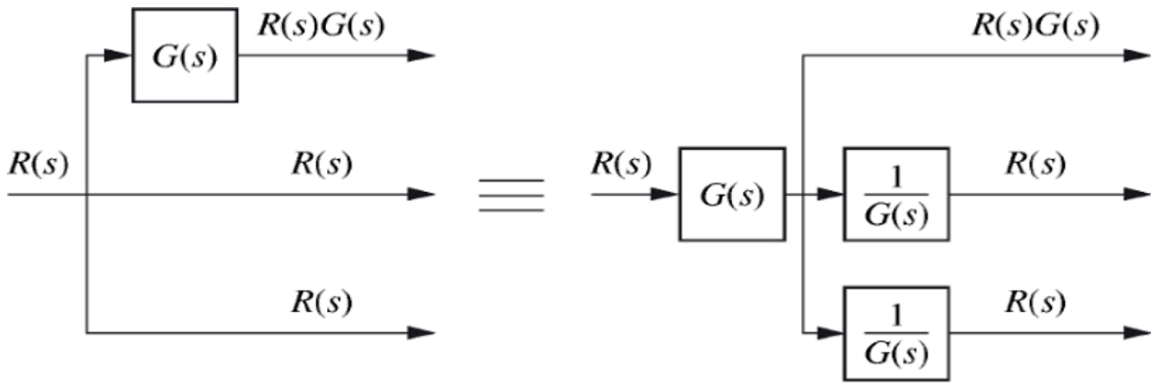
Pemindahan Blok

- Memindahkan blok ke kiri atau kanan melewati *summing junction*

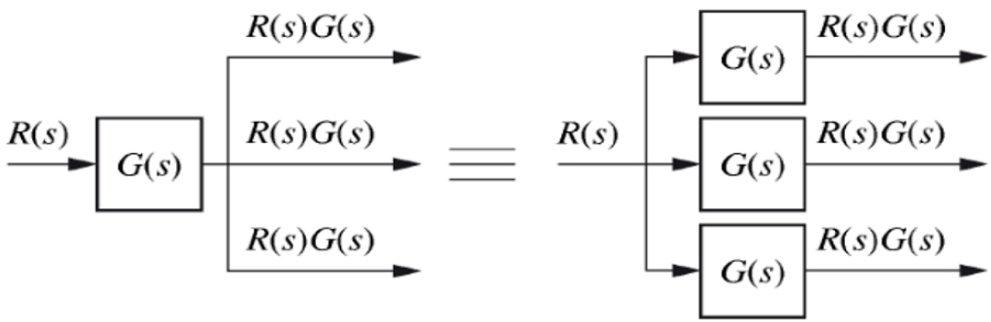


Pemindahan Blok

- Memindahkan blok ke kiri atau kanan melewati *pickoff point*



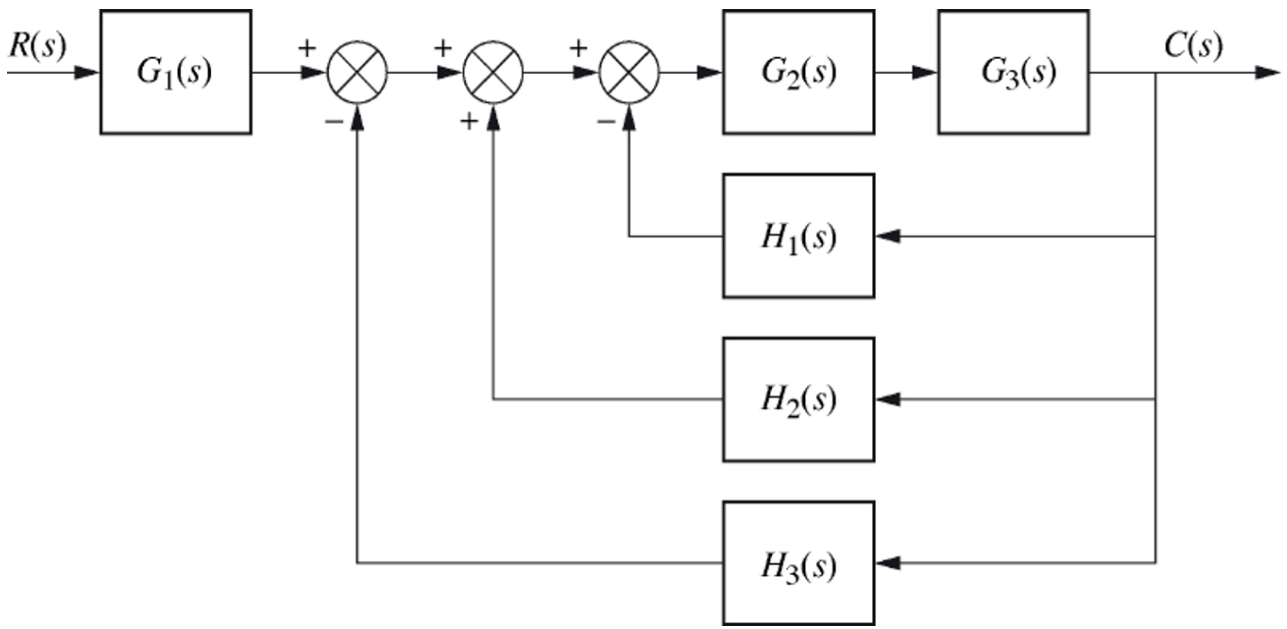
(a)



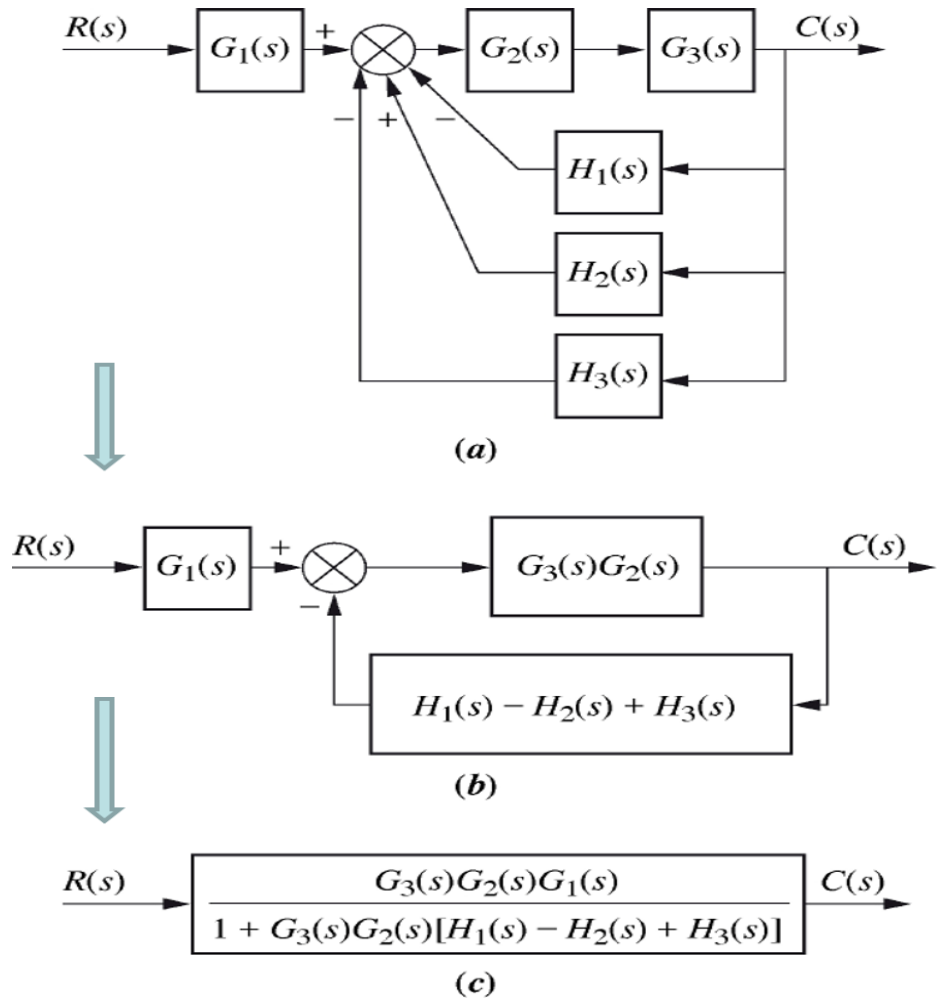
(b)

Contoh 1

Reduksi diagram blok berikut menjadi *loop* terbuka.

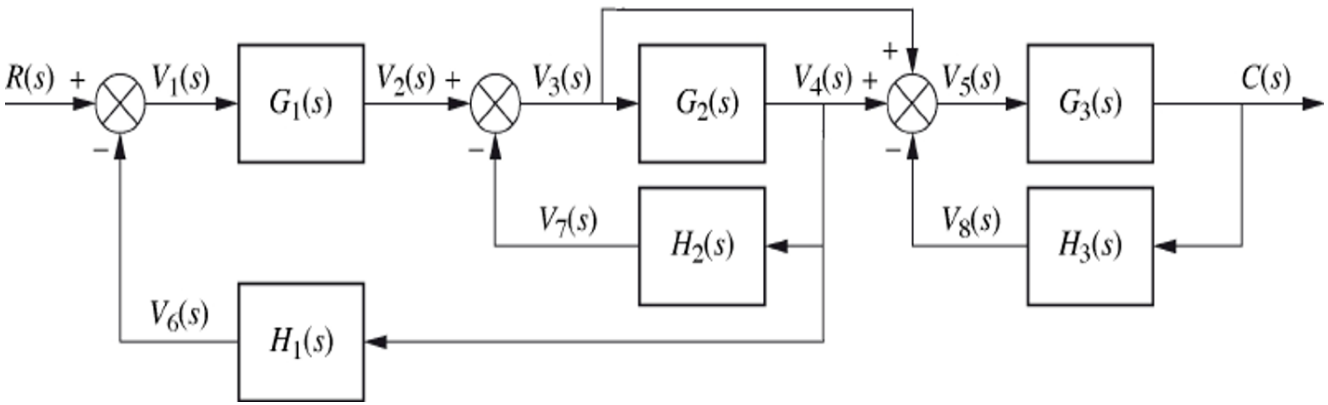


Solusi Contoh 1

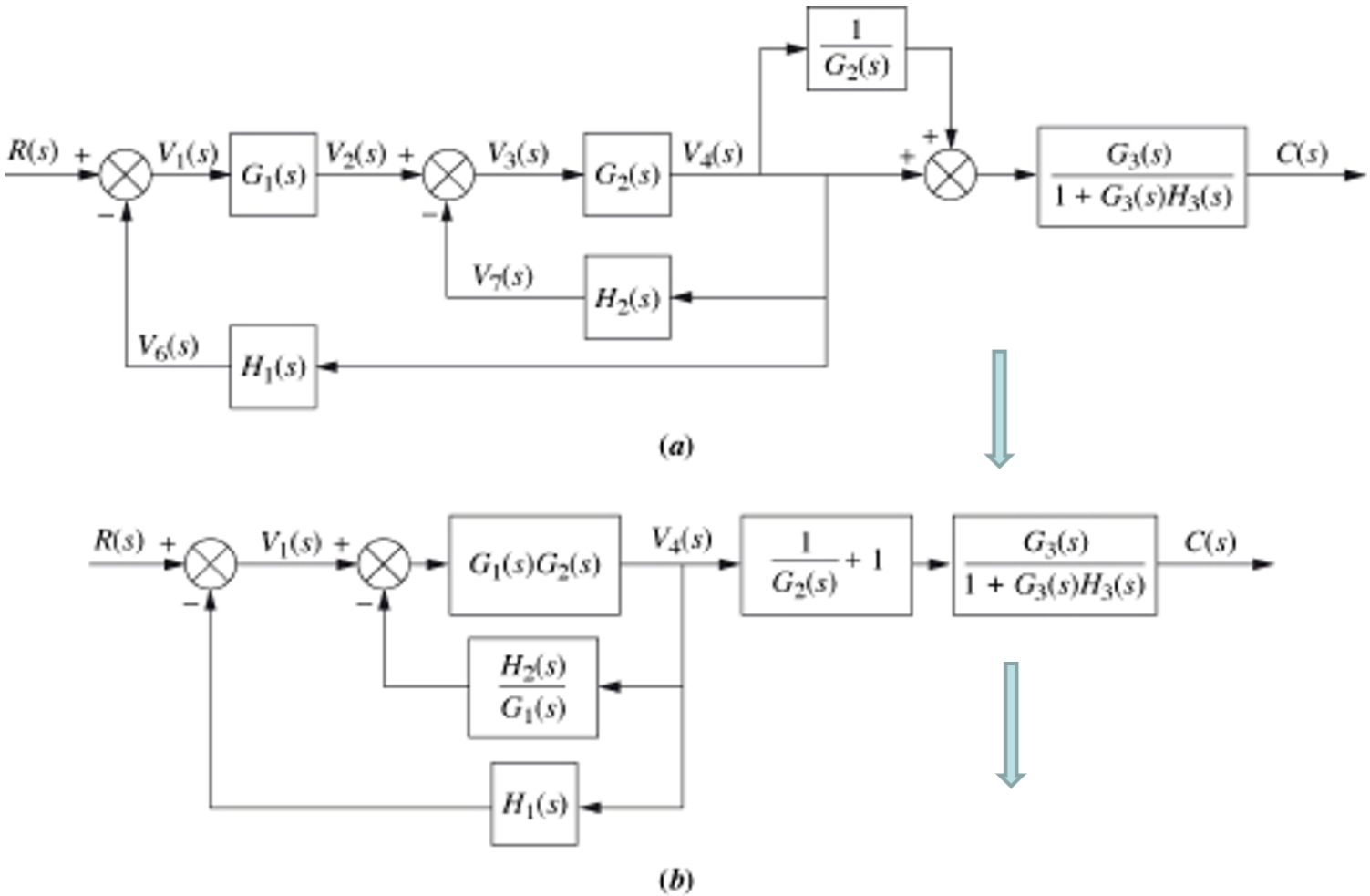


Contoh 2

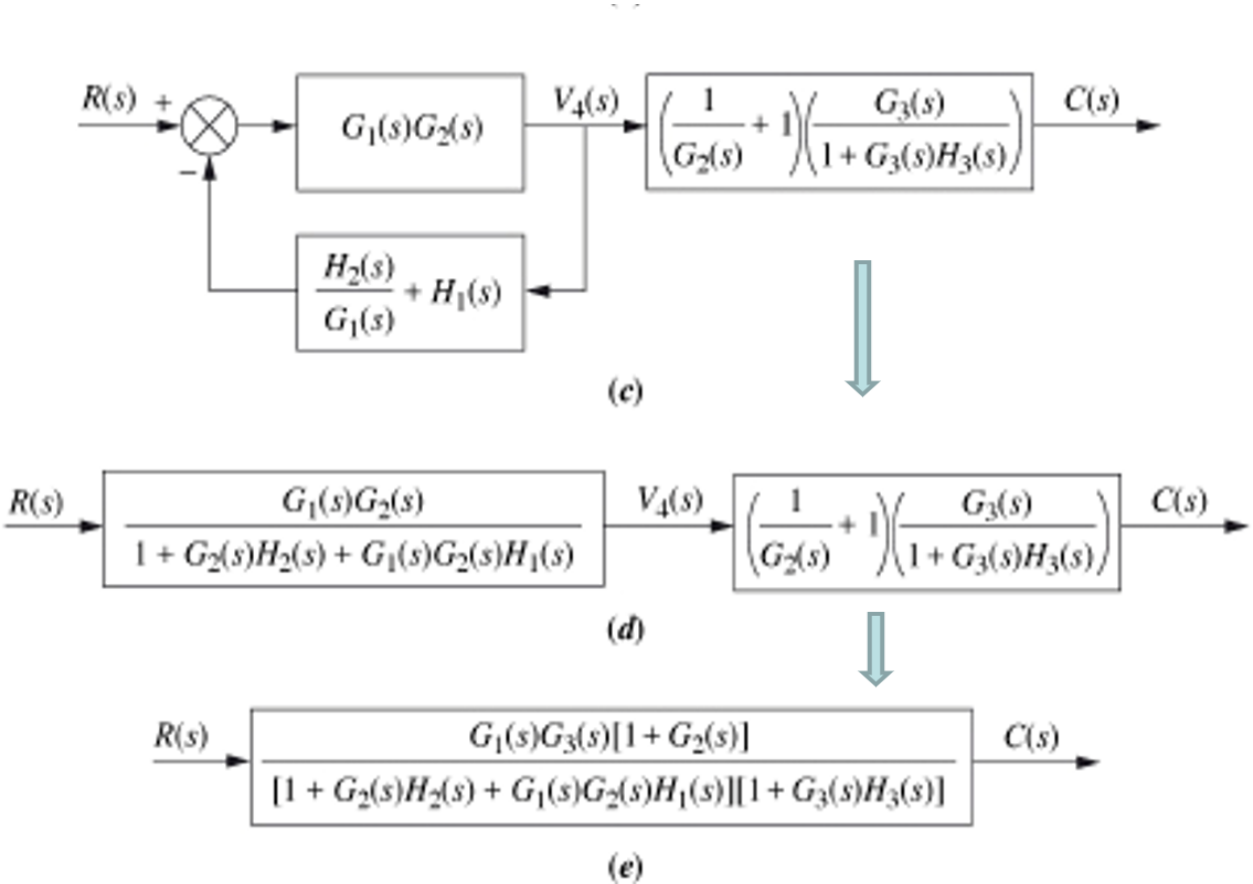
Reduksi diagram blok berikut menjadi *loop* terbuka.



Solusi Contoh 2

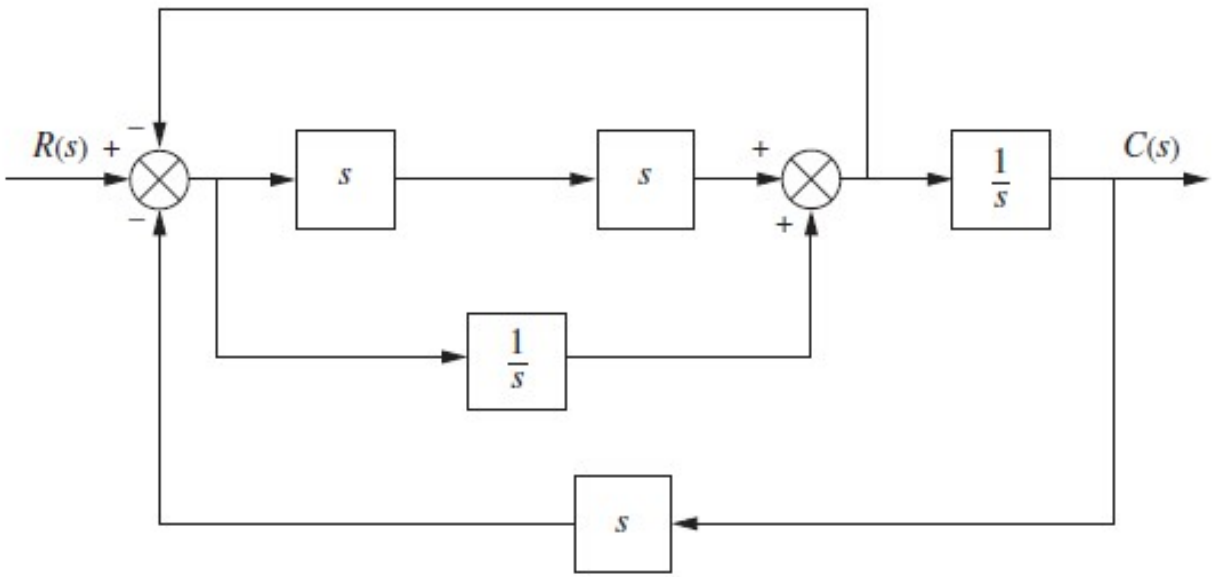


Solusi Contoh 2 (lanj.)



Latihan

Sederhanakan diagram blok pada Gambar 1 menjadi diagram blok lingkar terbuka dan dapatkan fungsi transfer $G(s) = C(s)/R(s)$.



Gambar 1: Diagram blok

Kunci:

$$G(s) = \frac{s^3 + 1}{2s^4 + s^2 + 2s}$$


YOU CAN
IF
YOU THINK YOU CAN
NEVER
GIVE UP!