



04 – Diagramas de bloques y simulación

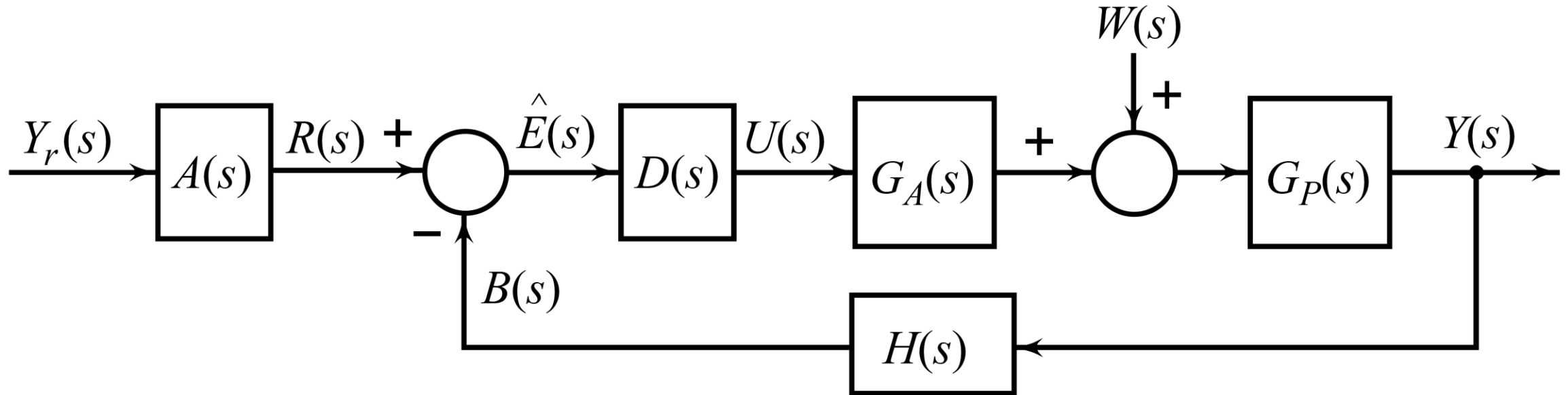
Biomecatrónica – 2023/II

Diagrama de bloques



- Representación gráfica de sistemas interconectados
- Cada sistema dinámico que tiene una relación de E/S es un **bloque**, que suele ser una sola función de transferencia
- Los bloques están conectados por trayectorias que representan el flujo de señal y los cálculos de entrada y salida
- El flujo de señal en un bloque representa una operación matemática, generalmente una multiplicación

Diagrama general de un SAC

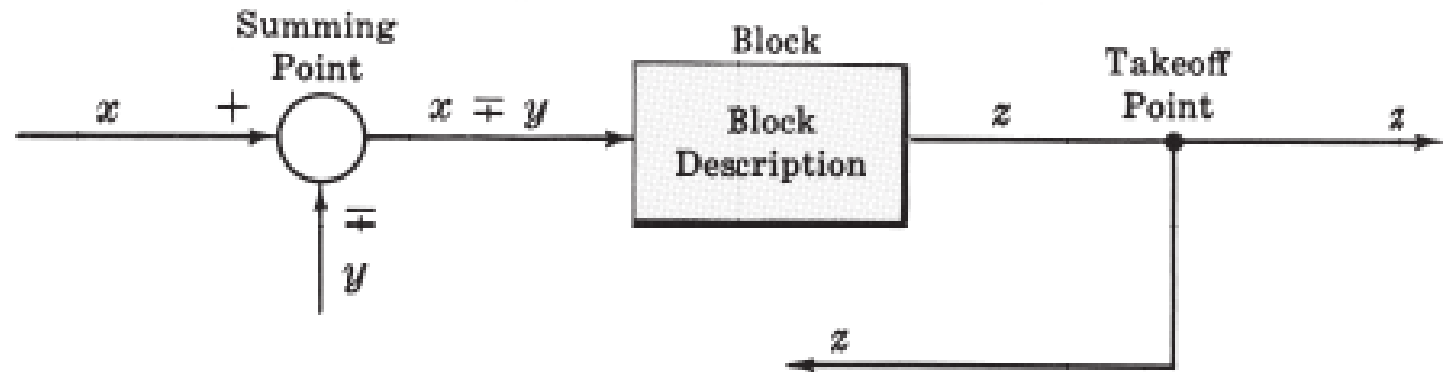


Elementos básicos

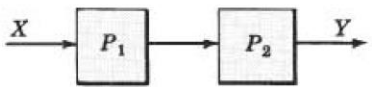
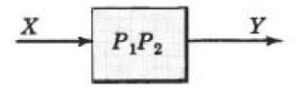
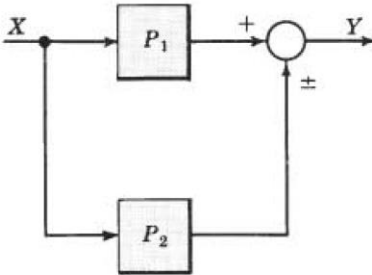
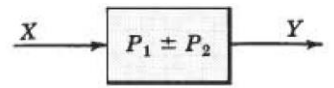
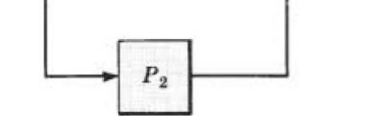
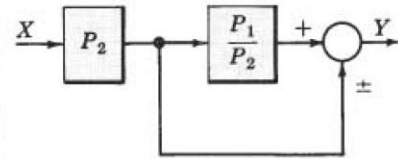
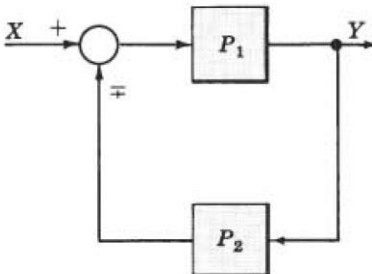
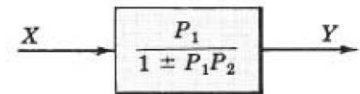
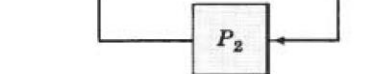
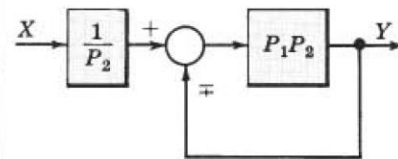


En general, un diagrama de bloques consta de una configuración específica de cuatro tipos de elementos:

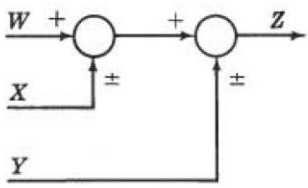
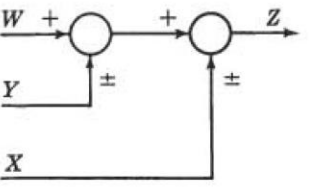
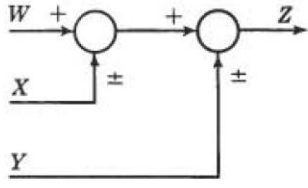
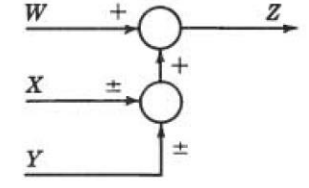
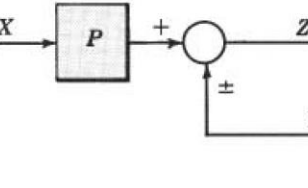
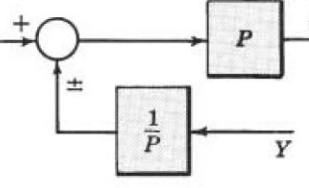
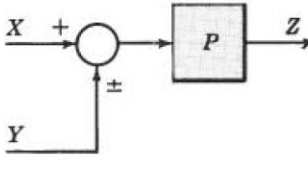
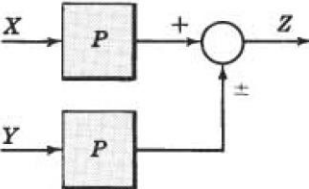
- bloques
- puntos de suma
- puntos de despegue
- flechas



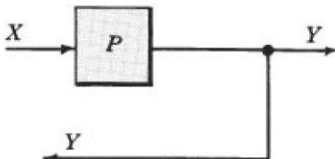
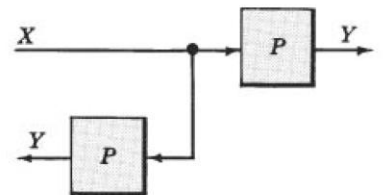
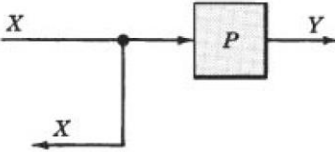
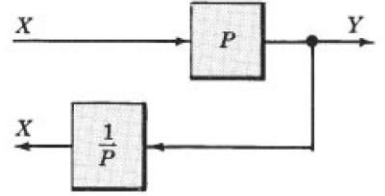
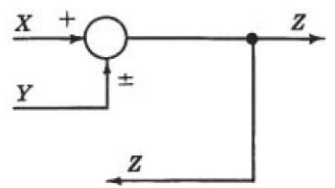
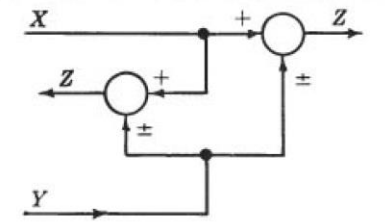
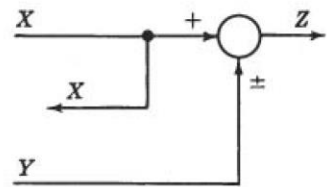
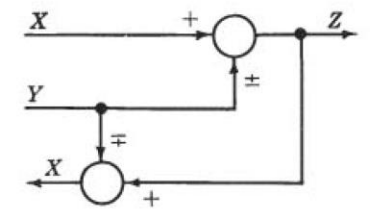
Operaciones

Transformation		Equation	Block Diagram	Equivalent Block Diagram
1	Combining Blocks in Cascade	$Y = (P_1 P_2)X$		
2	Combining Blocks in Parallel; or Eliminating a Forward Loop	$Y = P_1 X \pm P_2 X$		
3	Removing a Block from a Forward Path	$Y = P_1 X \pm P_2 X$		
4	Eliminating a Feedback Loop	$Y = P_1 (X \mp P_2 Y)$		
5	Removing a Block from a Feedback Loop	$Y = P_1 (X \mp P_2 Y)$		

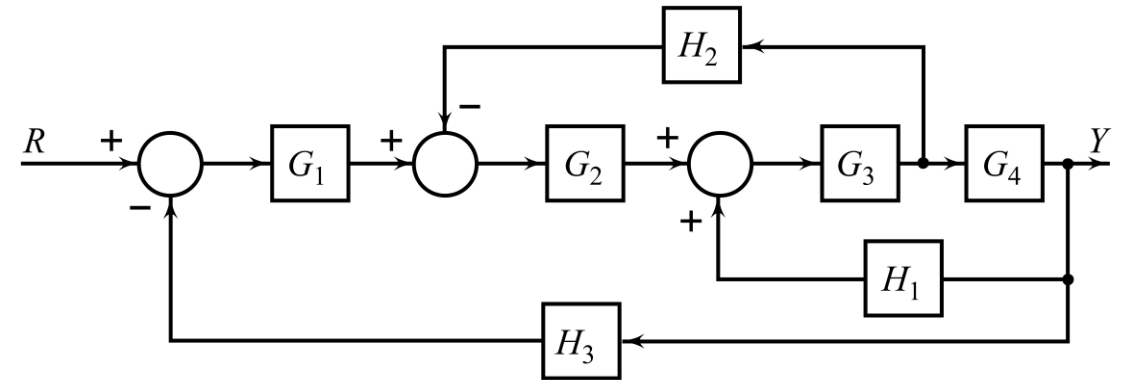
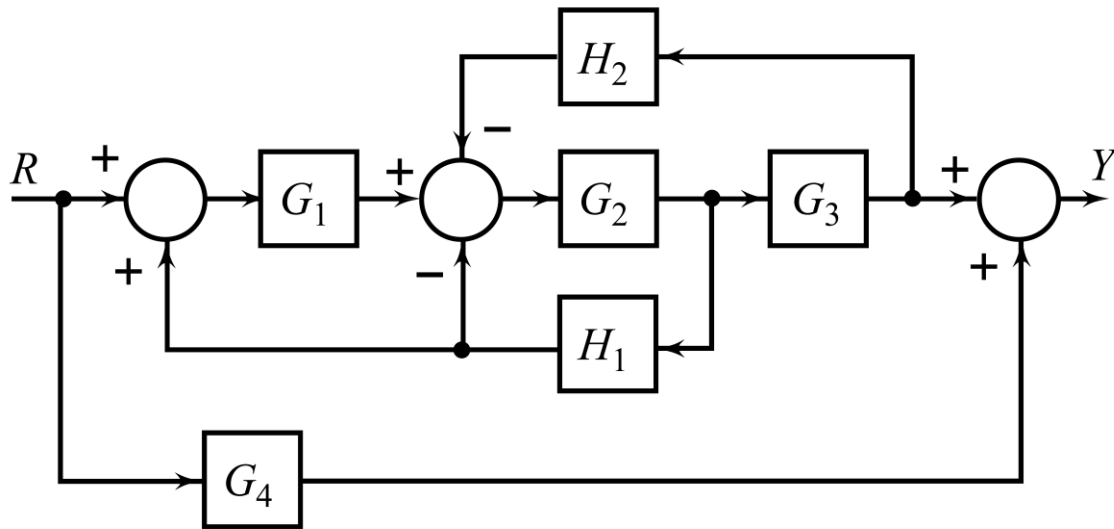
Operaciones

Transformation		Equation	Block Diagram	Equivalent Block Diagram
6a	Rearranging Summing Points	$Z = W \pm X \pm Y$		
6b	Rearranging Summing Points	$Z = W \pm X \pm Y$		
7	Moving a Summing Point Ahead of a Block	$Z = PX \pm Y$		
8	Moving a Summing Point Beyond a Block	$Z = P[X \pm Y]$		

Operaciones

Transformation		Equation	Block Diagram	Equivalent Block Diagram
9	Moving a Takeoff Point Ahead of a Block	$Y = PX$		
10	Moving a Takeoff Point Beyond a Block	$Y = PX$		
11	Moving a Takeoff Point Ahead of a Summing Point	$Z = X \pm Y$		
12	Moving a Takeoff Point Beyond a Summing Point	$Z = X \pm Y$		

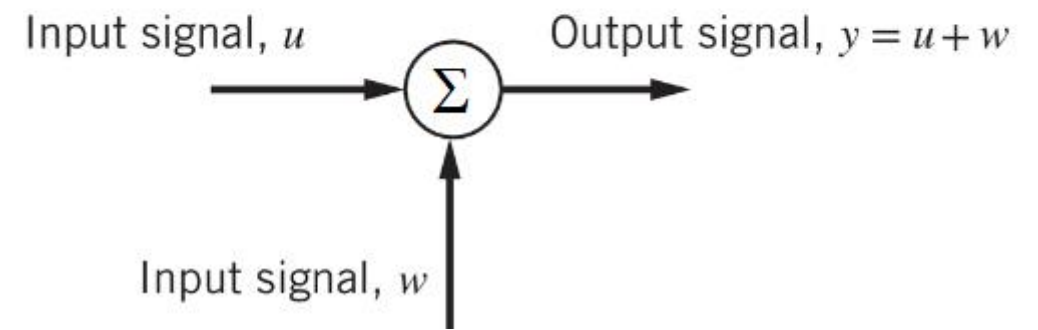
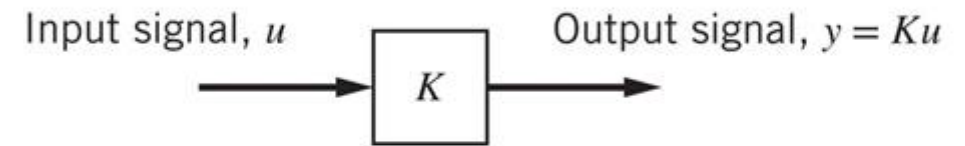
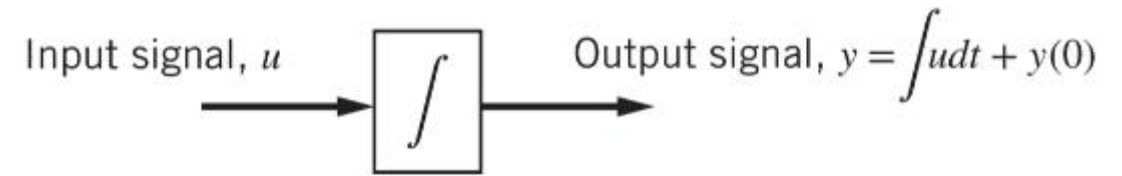
Ejemplos



Diagramas de simulación



- Representación gráfica de la SSR
- Solo se conforma por tres bloques básicos
 - Integrador
 - Ganancia
 - Suma



Ejemplo



Hallar **dos diagramas de simulación diferentes** para el sistema modelado por la función de transferencia

$$H(s) = \frac{s + 3}{s^3 + 9s^2 + 24s + 20}$$