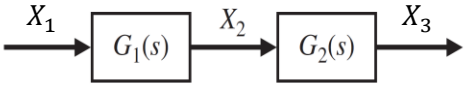
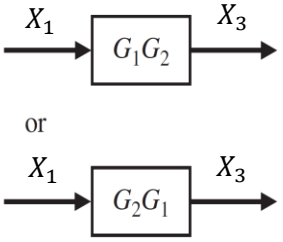
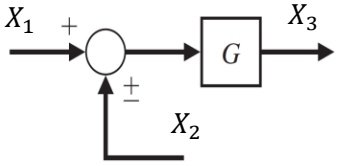
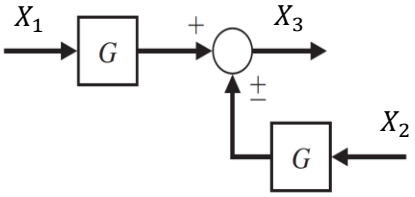
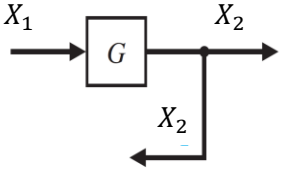
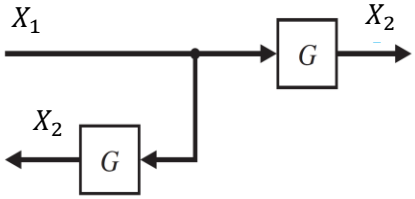
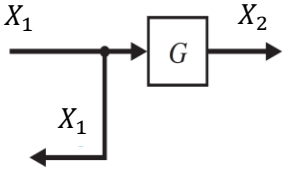
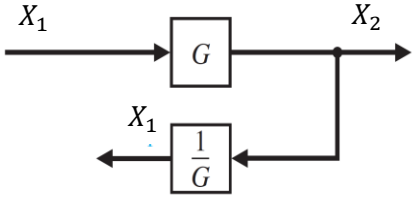
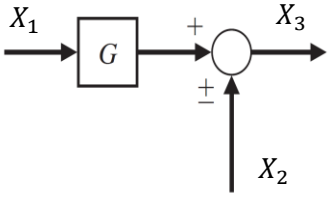
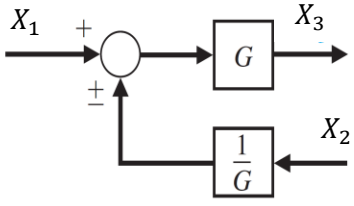
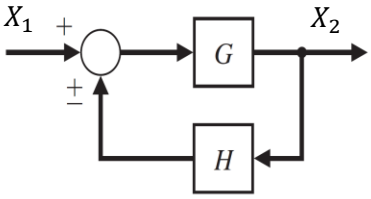
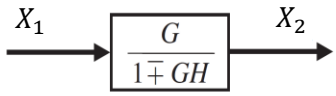
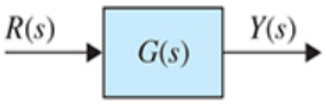
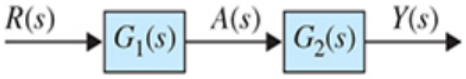
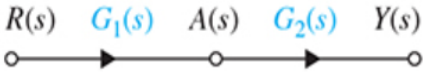
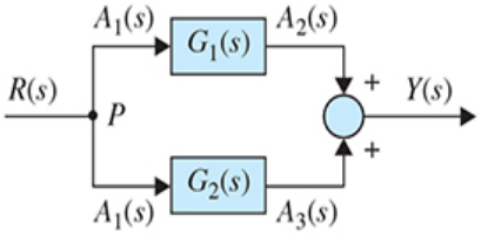
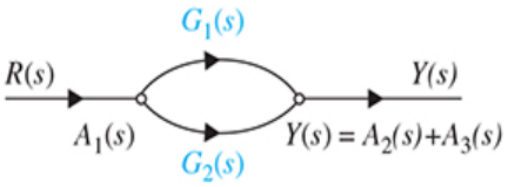
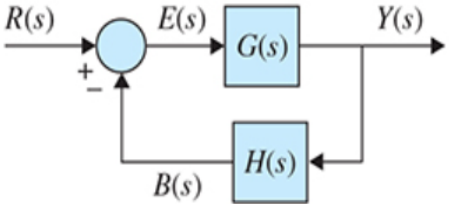
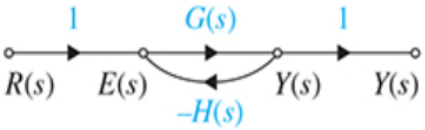
Block Diagram Transformation

Transformation	Original Diagram	Equivalent Diagram
1. Combining blocks in cascade		
2. Moving a summing point behind a block		
3. Moving a pickoff point ahead of a block		
4. Moving a pickoff point behind a block		
5. Moving a summing point ahead of a block		
6. Eliminating a feedback loop		

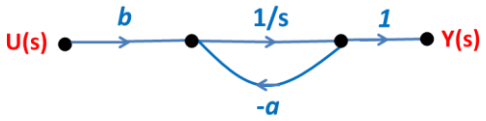
Relation Between Block Diagrams & SFGs

Transfer Function	Block Diagram	Signal Flow Diagram
One block System $\frac{Y(s)}{R(s)} = G(s)$	(a) 	(b) 
Cascade $\frac{Y(s)}{R(s)} = G_1(s)\,G_2(s)$	(c) 	(d) 
Parallel $\frac{Y(s)}{R(s)} = G_1(s) + G_2(s)$	(e) 	(f) 
Feedback $\frac{Y(s)}{R(s)} = \frac{G(s)}{1 + G(s)\,H(s)}$	(g) 	(h) 

Relation Between Basic Transfer Functions & SFGs

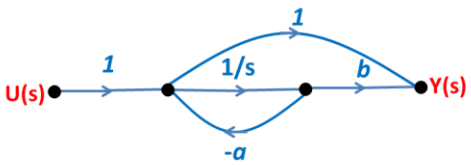
❑ First-order Transfer Function with no Zero:

$$\frac{Y(s)}{U(s)} = \frac{b}{s+a}$$



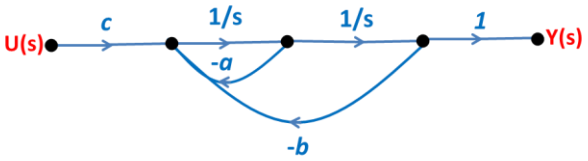
❑ First-order Transfer Function with a single Zero:

$$\frac{Y(s)}{U(s)} = \frac{s+b}{s+a}$$



❑ Second-order Transfer Function with no Zero:

$$\frac{Y(s)}{U(s)} = \frac{c}{s^2+as+b}$$



❑ Second-order Transfer Function with a single Zero:

$$\frac{Y(s)}{U(s)} = \frac{s+c}{s^2+as+b}$$