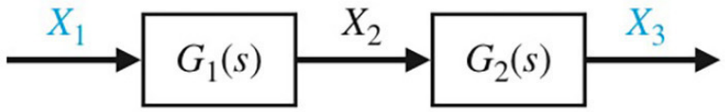
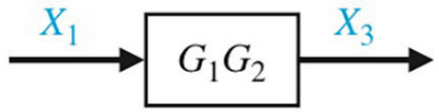
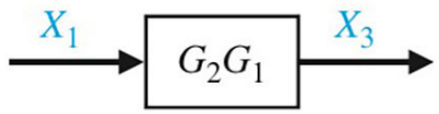
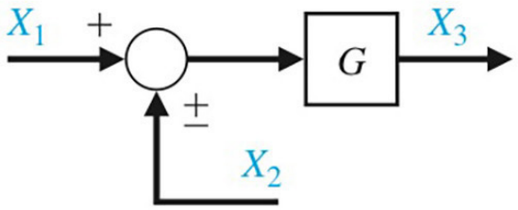
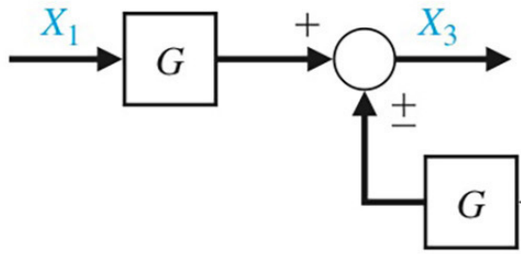
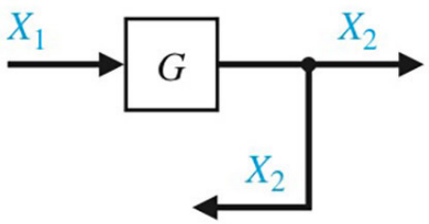
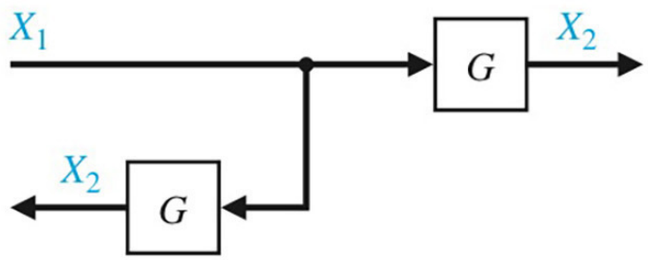
Table 2.5 Block Diagram Transformations

Transformation	Original Diagram	Equivalent Diagram
1. Combining blocks in cascade		 or 
2. Moving a summing point behind a block		
3. Moving a pickoff point ahead of a block		

continued on next slide

Table 2.5 Block Diagram Transformations

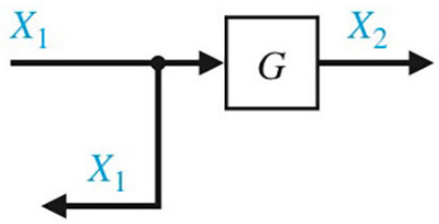
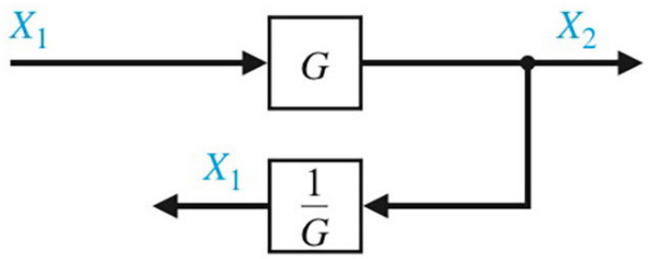
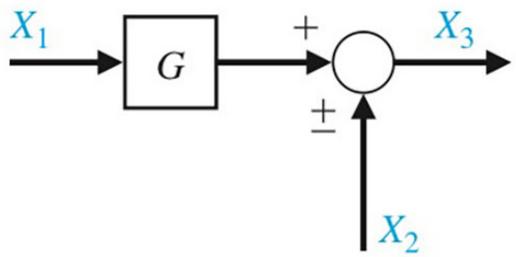
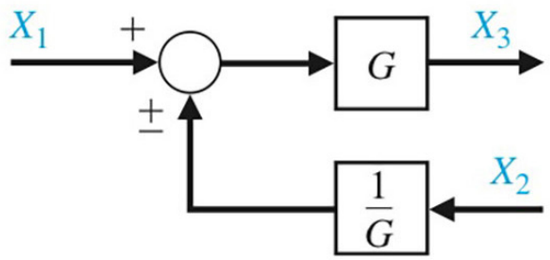
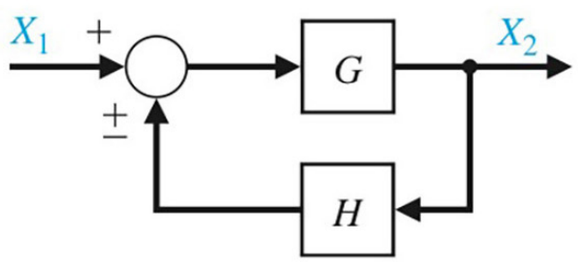
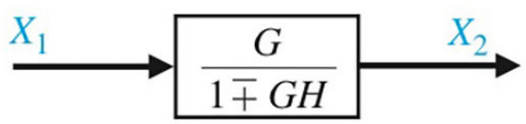
Transformation	Original Diagram	Equivalent Diagram
4. Moving a pickoff point behind a block		
5. Moving a summing point ahead of a block		
6. Eliminating a feedback loop		

FIGURE 2.25 Multiple-loop feedback control system.

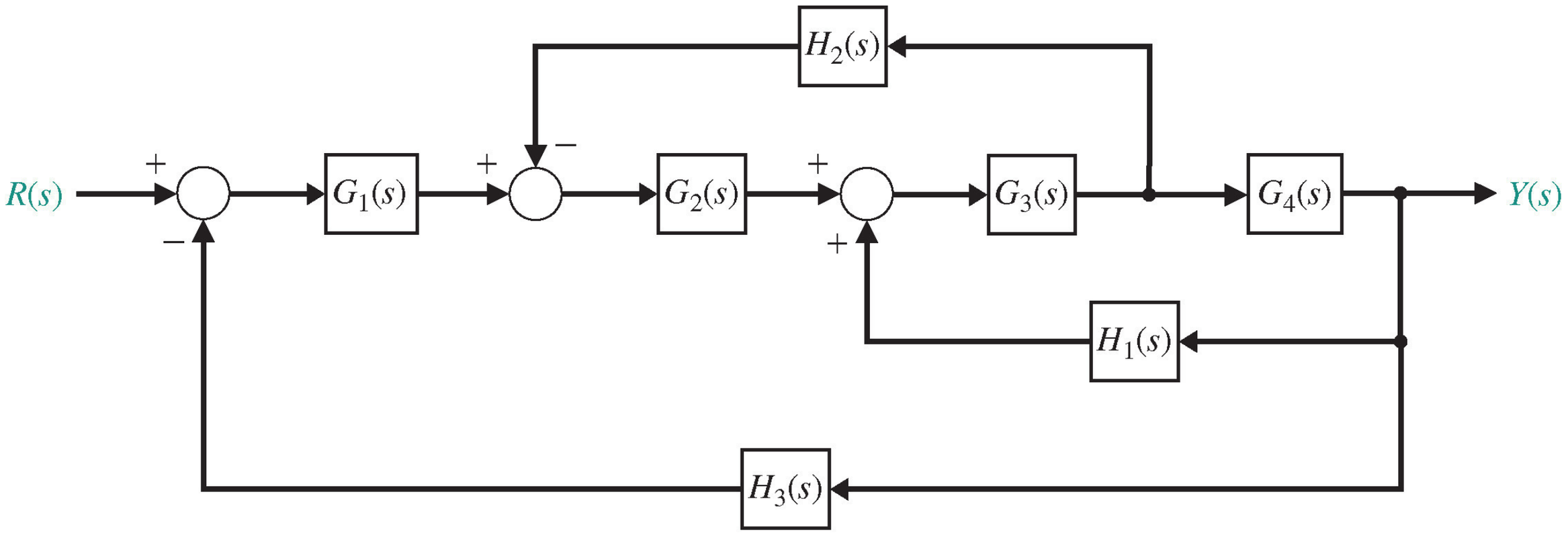
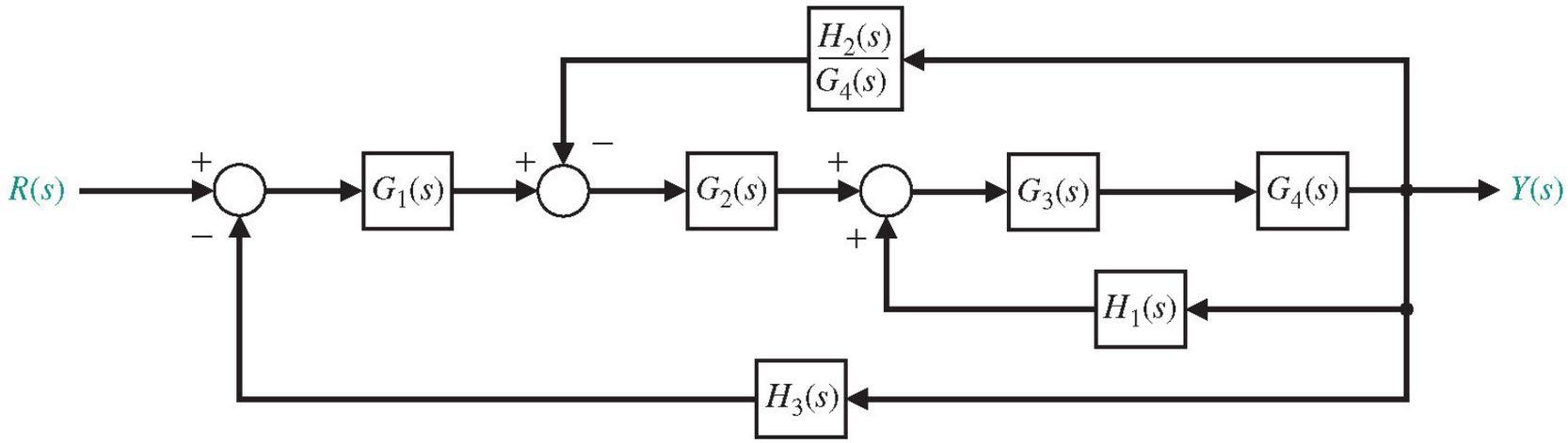
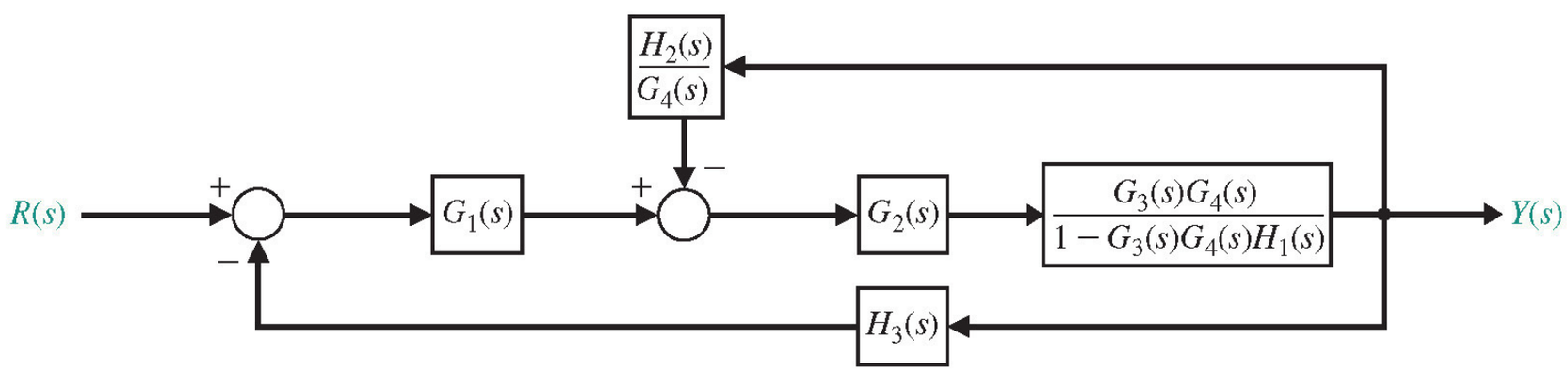


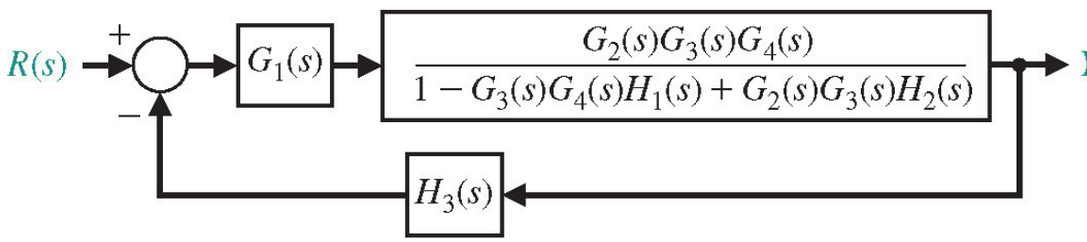
FIGURE 2.26 Block diagram reduction of the system of Figure 2.25.



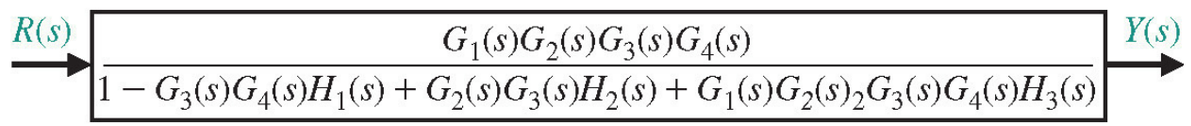
(a)



(b)



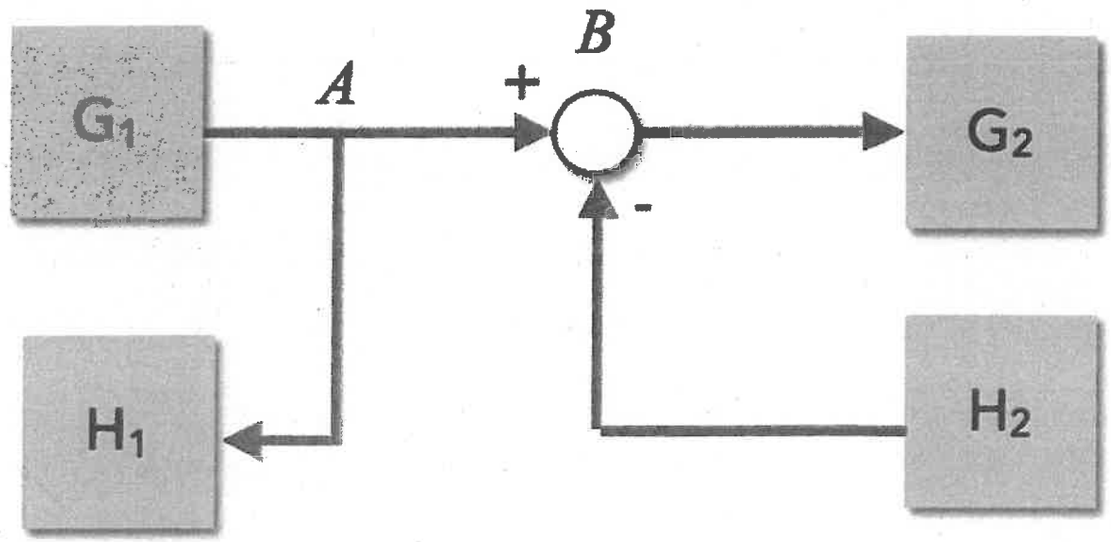
(c)



(d)

So When Do You Need to Separate the Loops in a Signal Flow Graph???

Take a look at the diagram below



The take off point *A* is before the summing point *B*. You need to represent the summing point and the take off points with separate nodes joined by a branch with a value of '1'. This will separate the loops. (Do the same if a take off point is directly behind a summing point.)

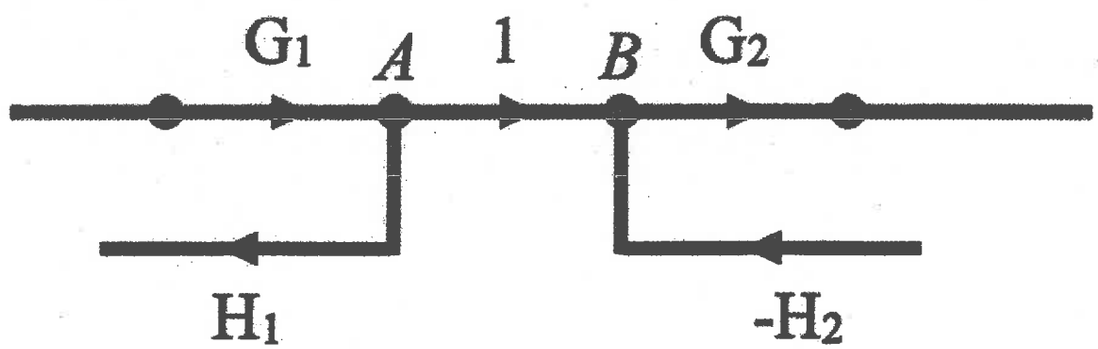


FIGURE 3.15 A block diagram model of an open-loop DC motor control with velocity as the output.

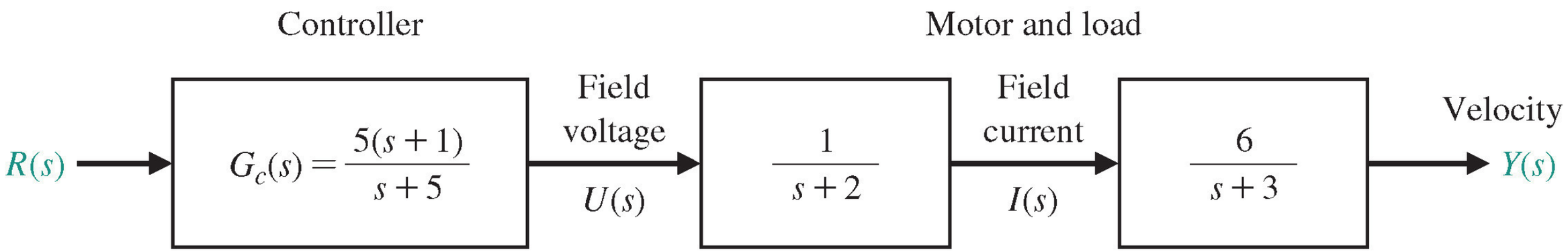
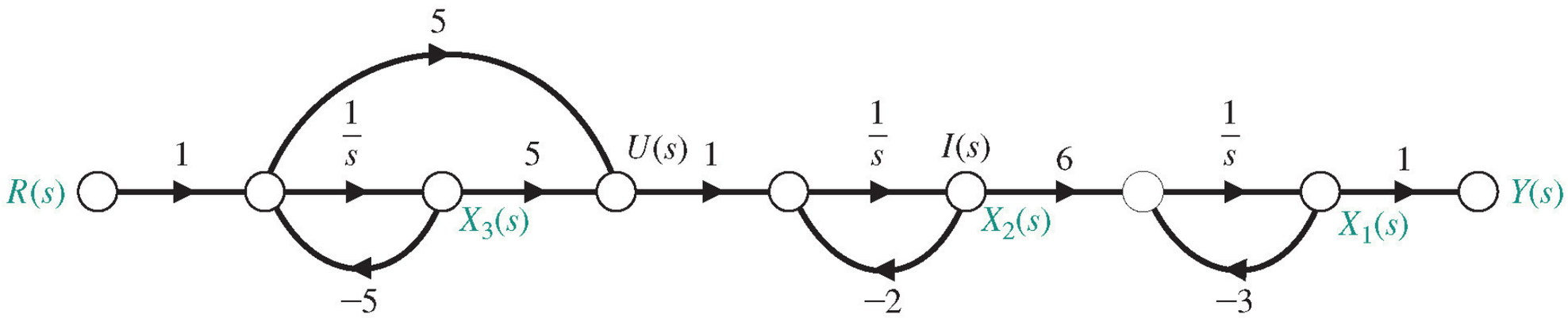
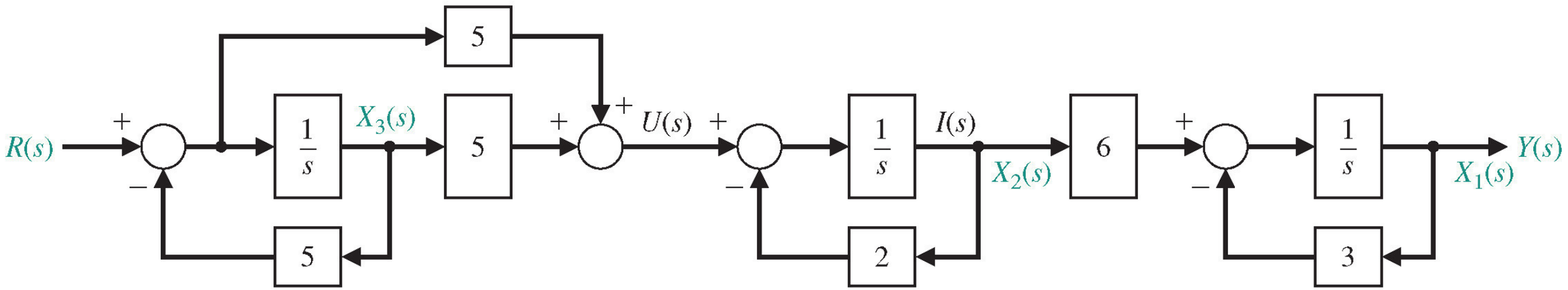


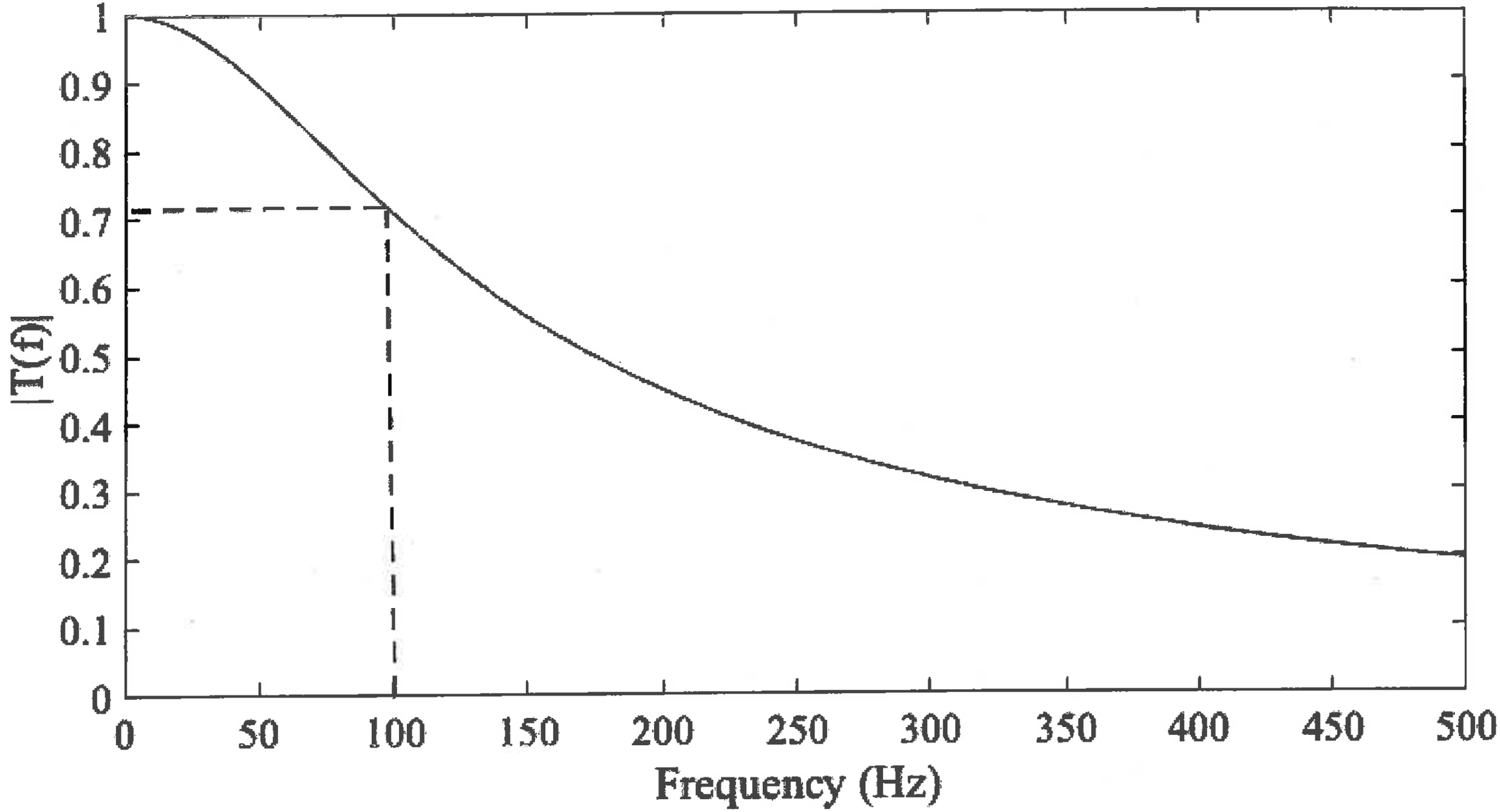
FIGURE 3.16 (a) The physical state variable signal-flow graph for the block diagram of Figure 3.15. (b) Physical state block diagram.



(a)



(b)



Notice at 100 Hz the gain is $0.707 = 1/\sqrt{2}$

For a value of $C = 1.0\mu f$, $R \approx 1.1K^{\Omega}$