Chapter 6

Stability

Figure 6.1
Closed-loop poles and response:
a. stable system;
b. unstable system

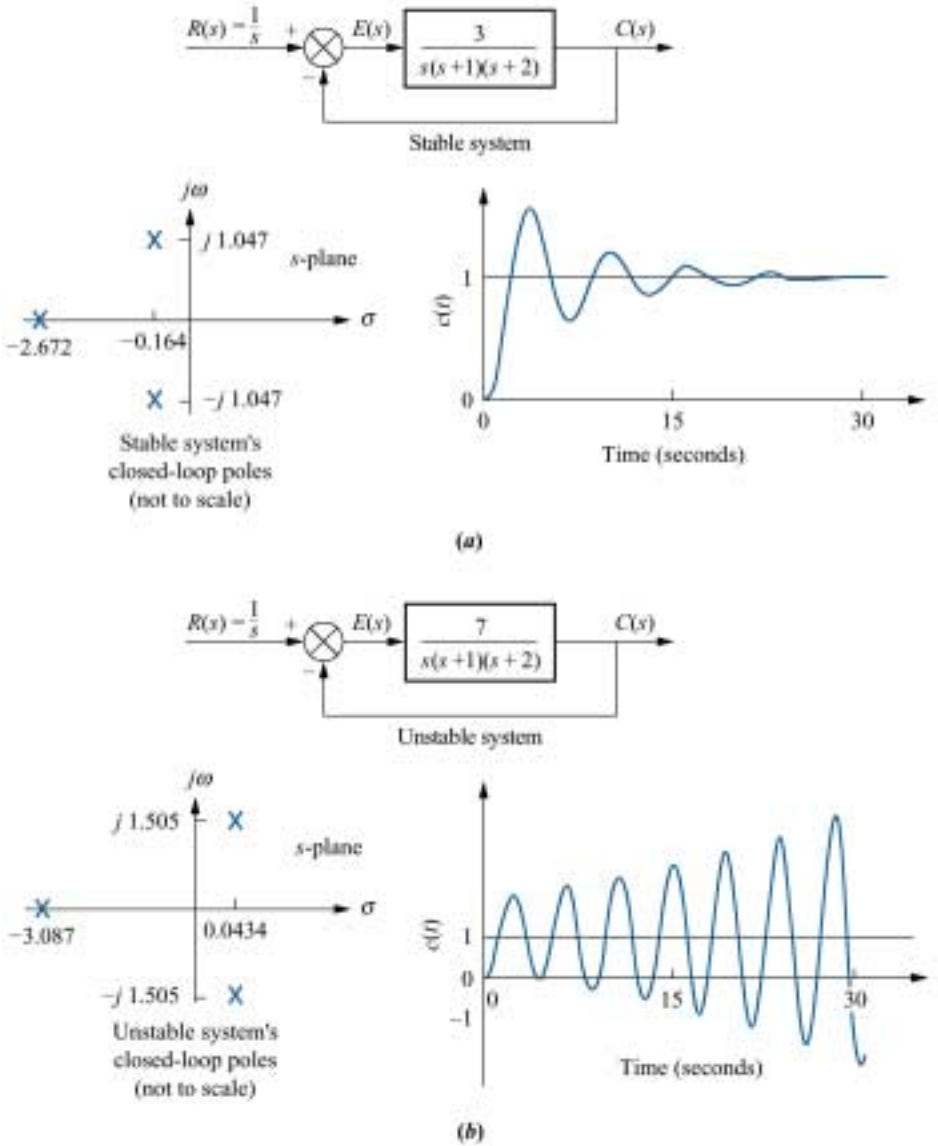


Figure 6.2
Common cause of problems in finding closed-loop poles:
a. original system;
b. equivalent system

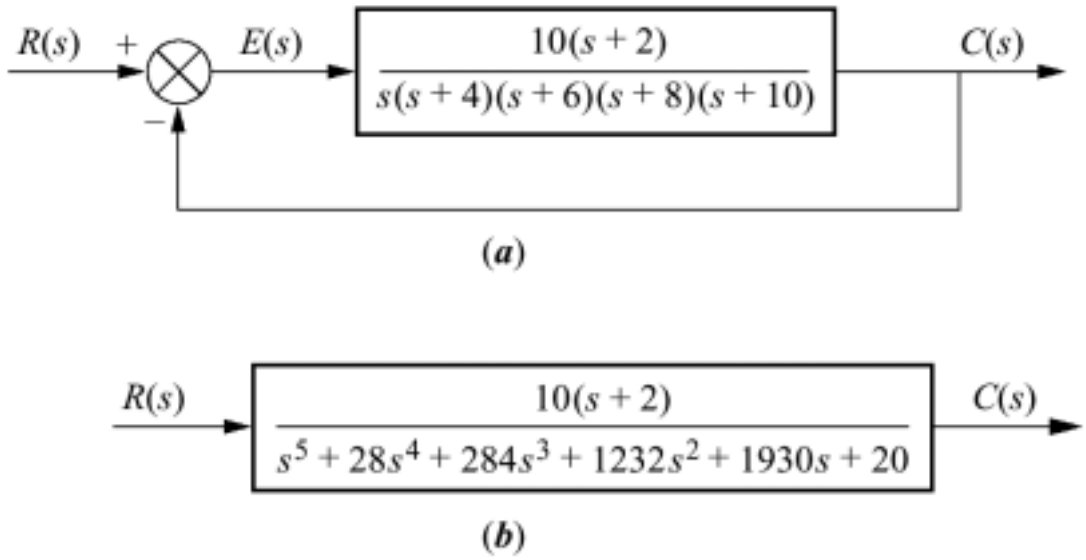


Figure 6.3
Equivalent closed-loop transfer function

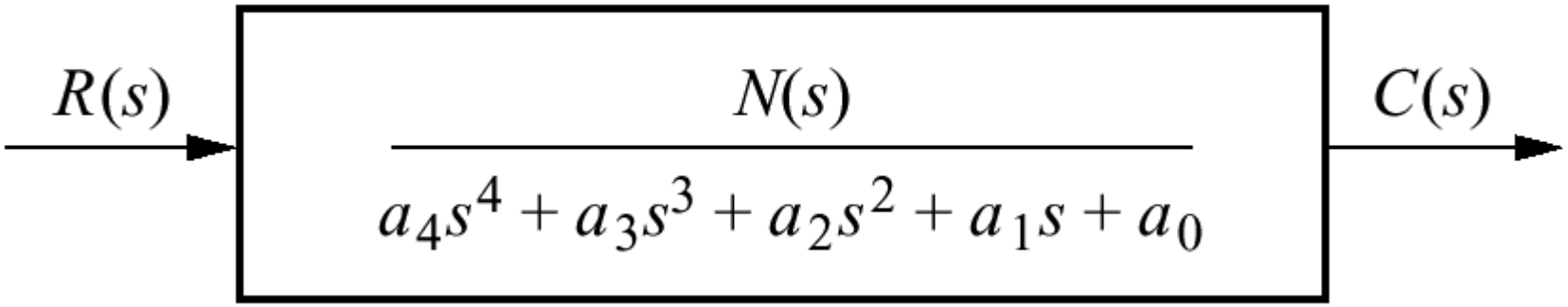


Figure 6.4
a. Feedback system for Example 6.1;
b. equivalent closed-loop system

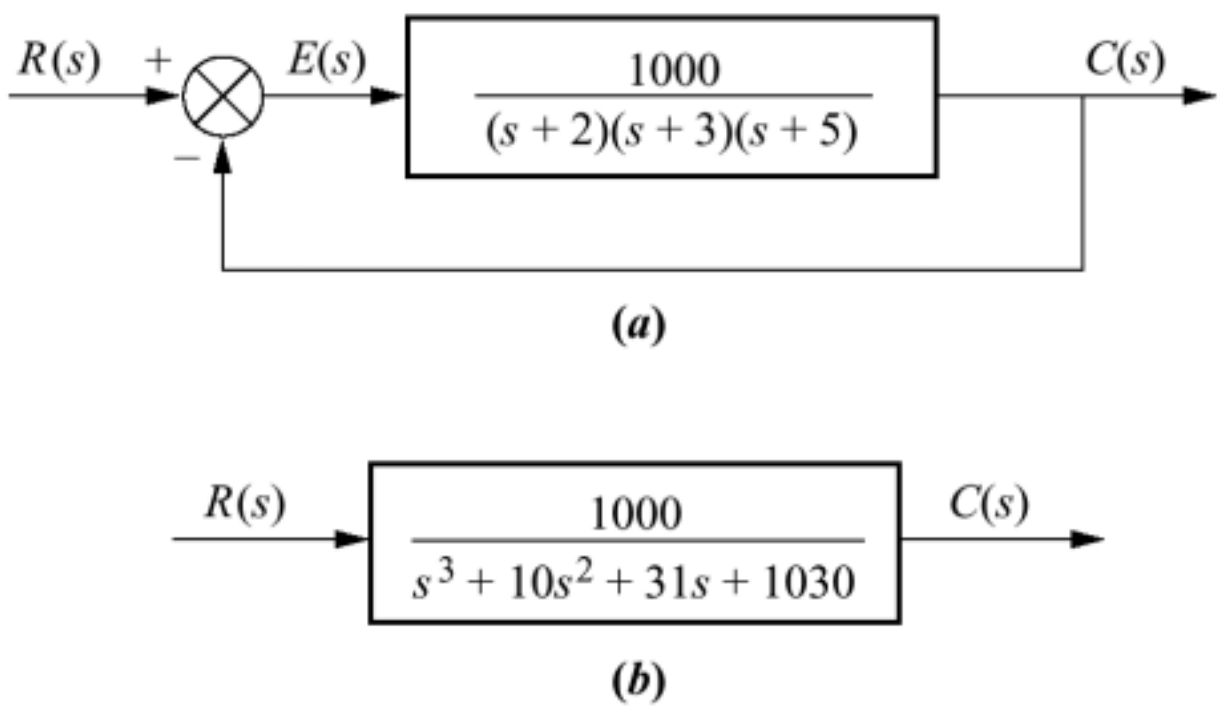


Figure 6.5
Root positions to generate even polynomials: *A* , *B*, *C*, or any combination

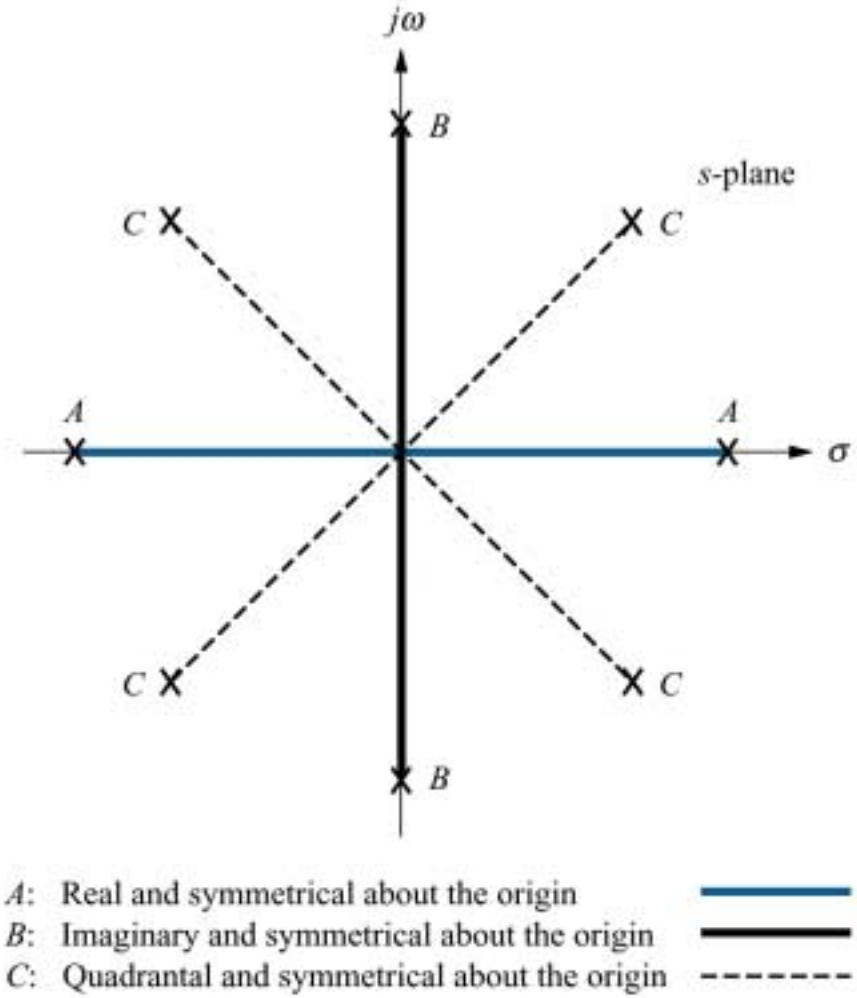


Figure 6.6
Feedback
control system
for Example 6.6

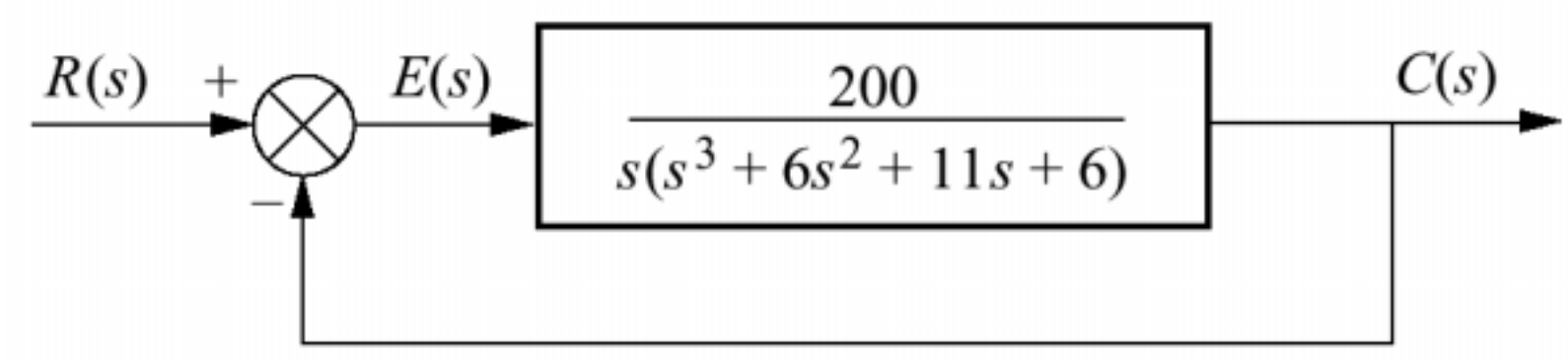


Figure 6.7
Feedback control system for Example 6.7

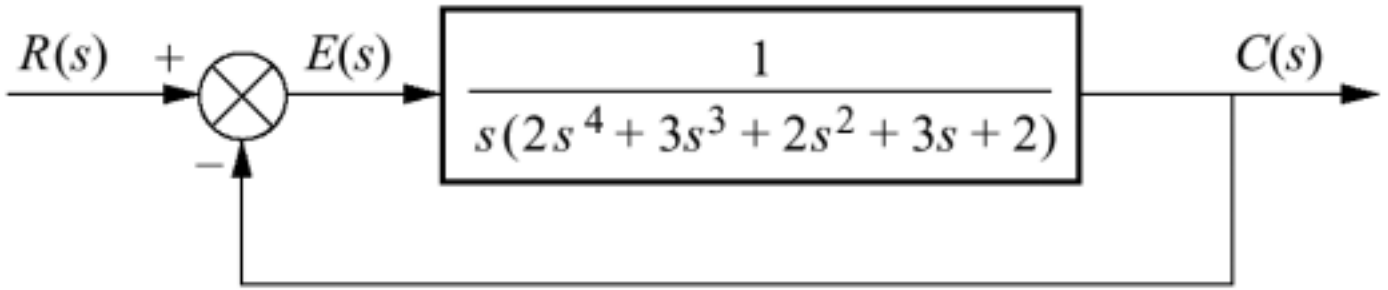


Figure 6.8
Feedback
control system
for Example 6.8

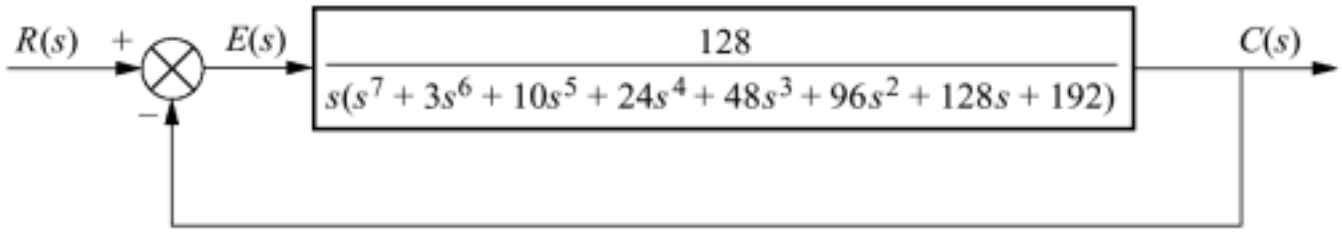


Figure 6.9
Jason is an underwater, remote-controlled vehicle that has been used to explore the wreckage of the *Lusitania*. The manipulator and camera comprise some of the vehicle's control systems.

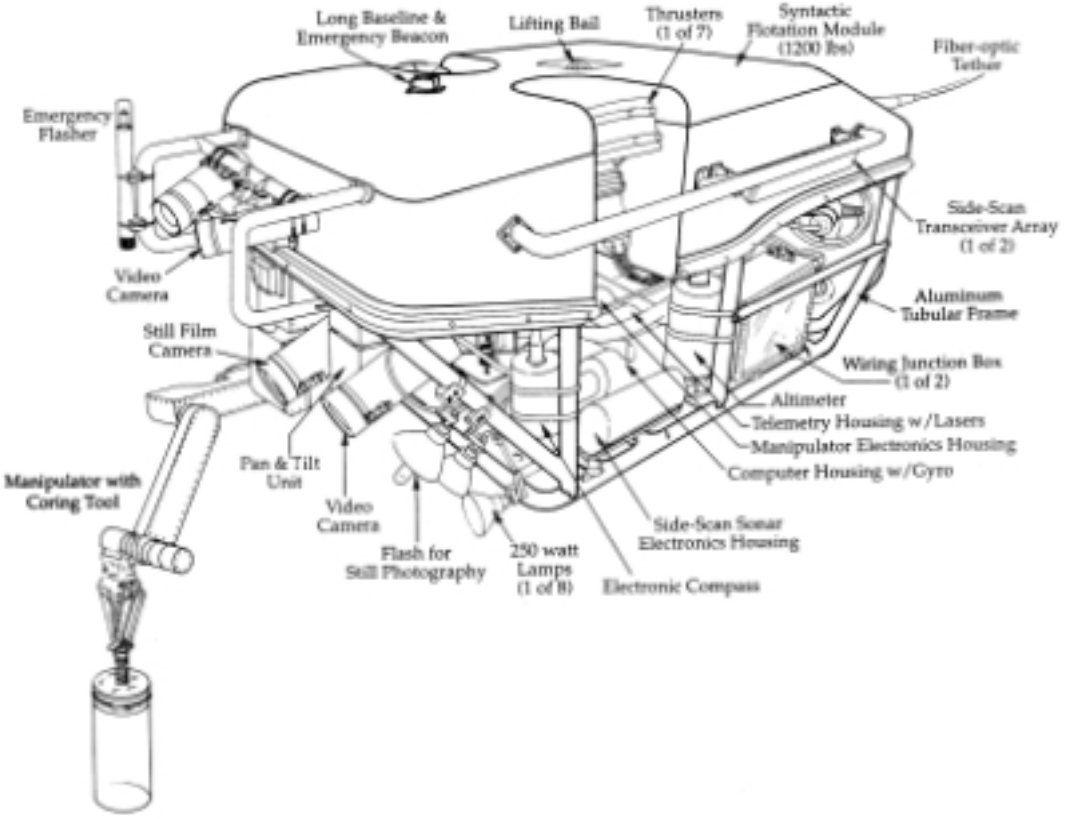


Figure 6.10
Feedback control system for Example 6.9

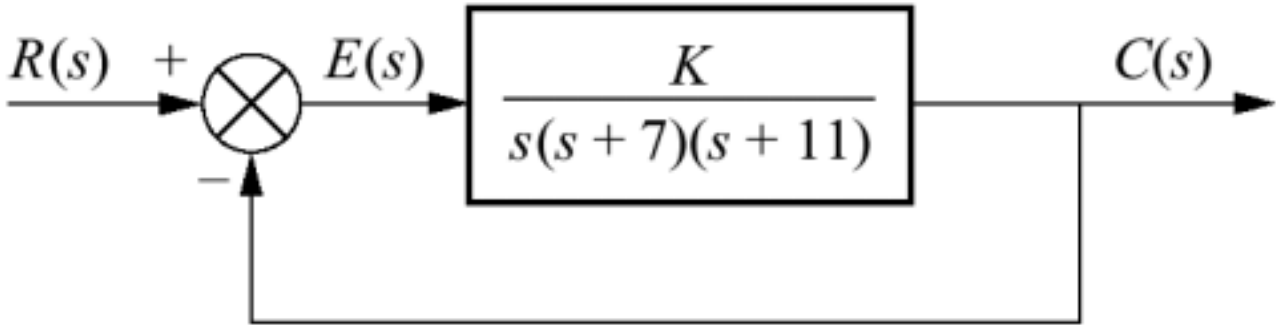


Figure 6.11
The FANUC Robot M- 400 can be configured for 4- or 5- axis of motion. It is seen here moving and stacking boxes.

Figure P6.1

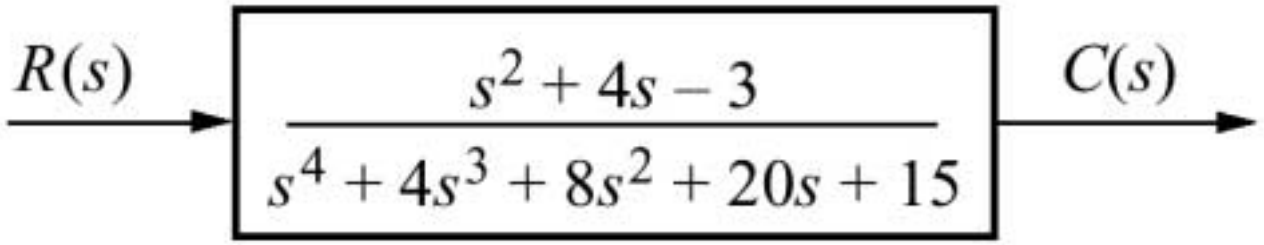


Figure P6.2

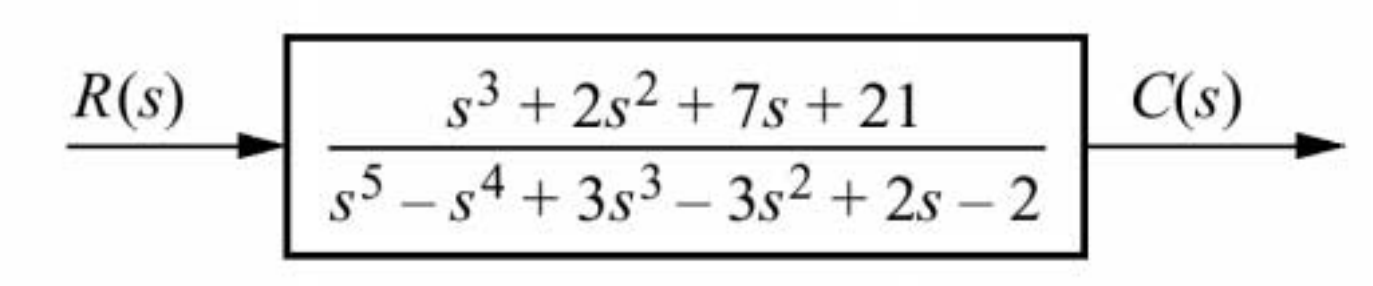


Figure P6.3

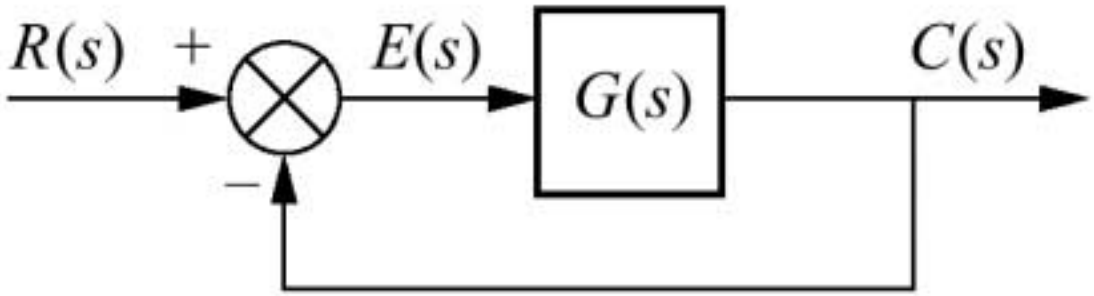


Figure P6.4

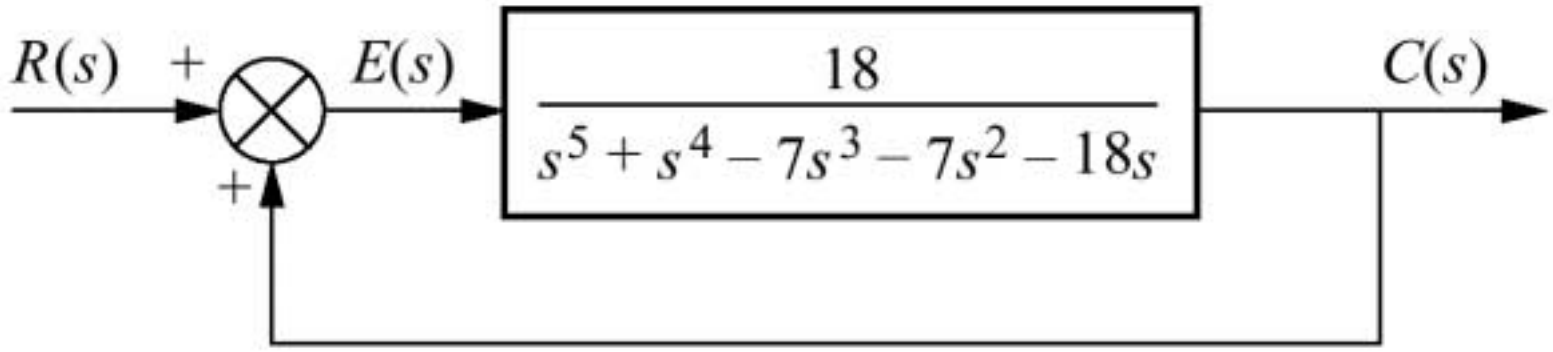


Figure P6.5

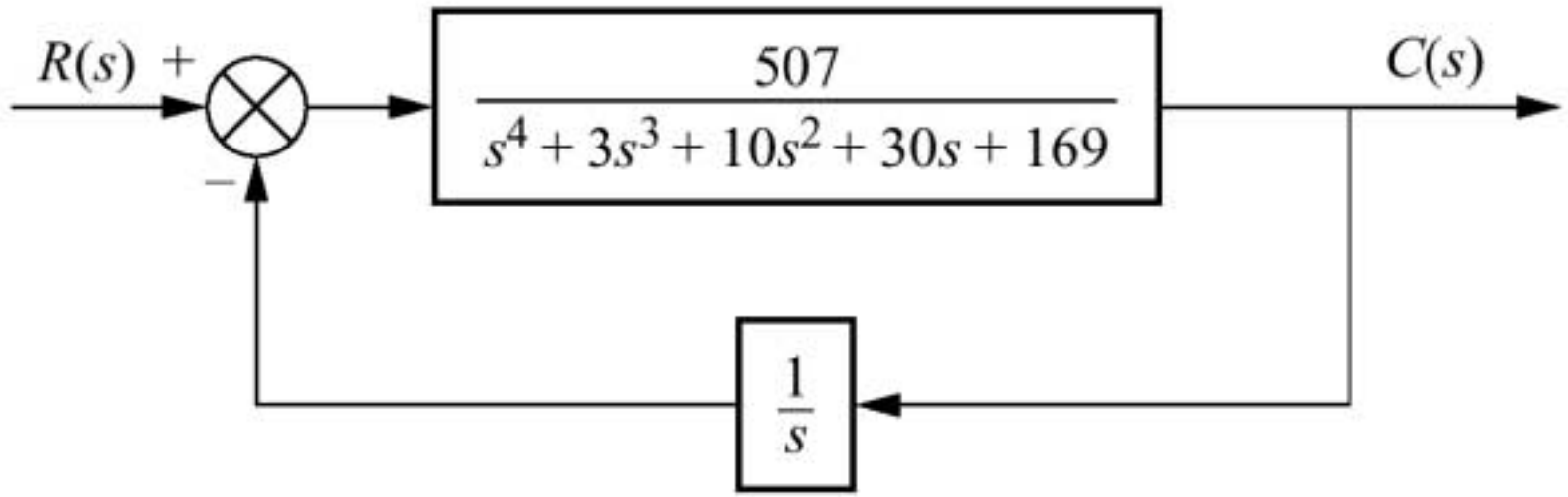


Figure P6.6

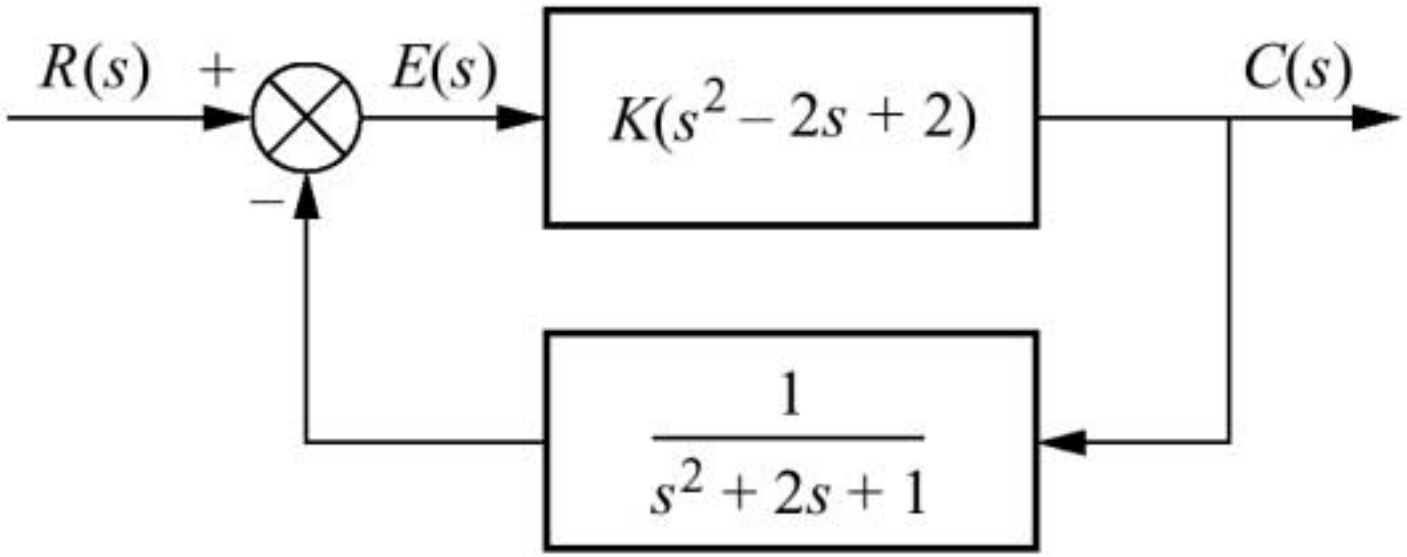


Figure P6.7

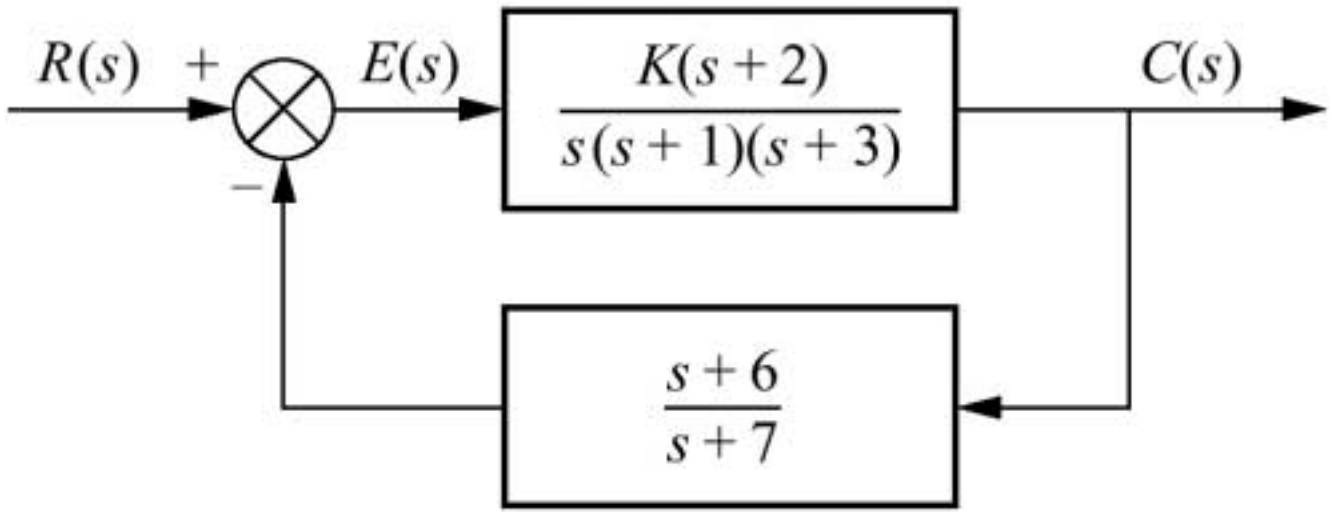


Figure P6.8

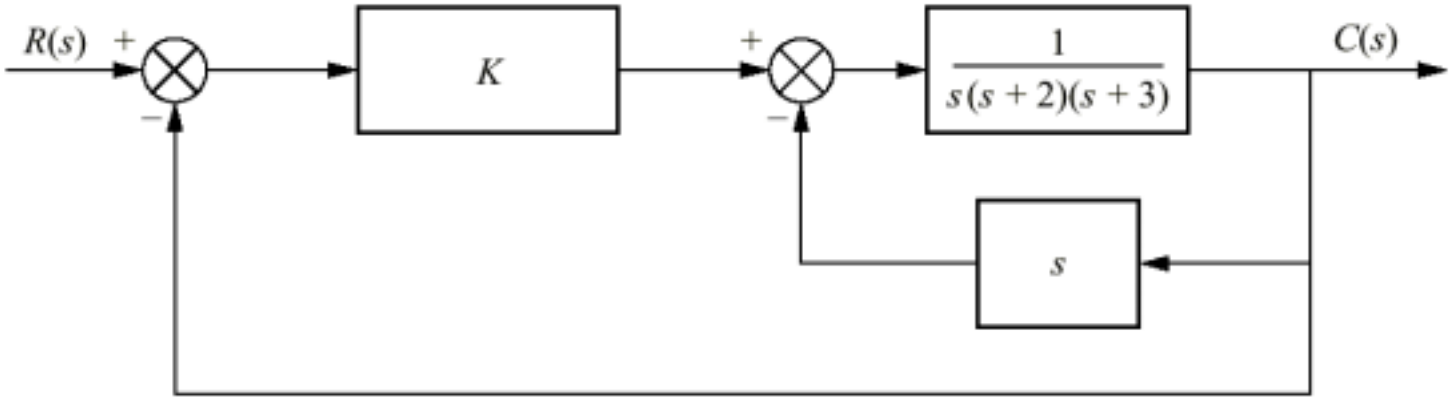


Figure P6.9

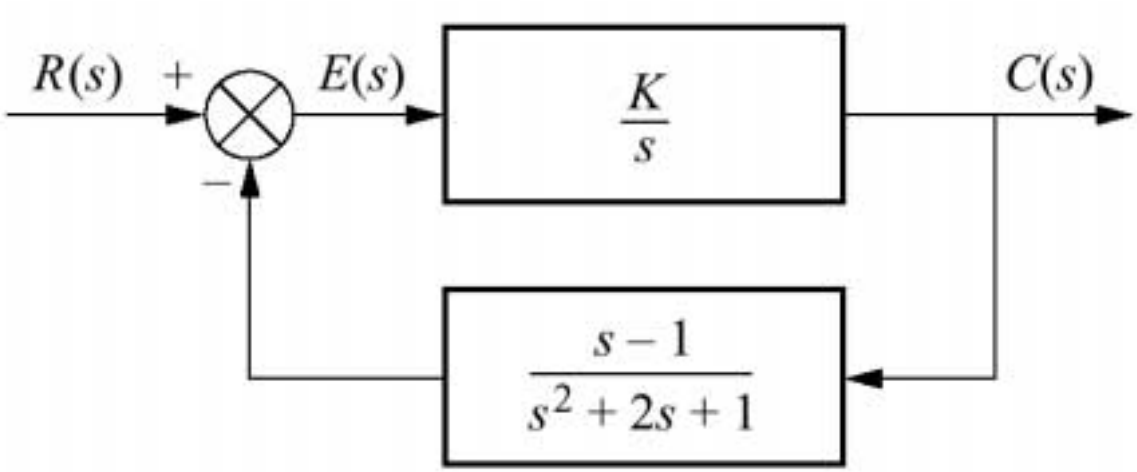


Figure P6.10
Closed-loop system with pole plot

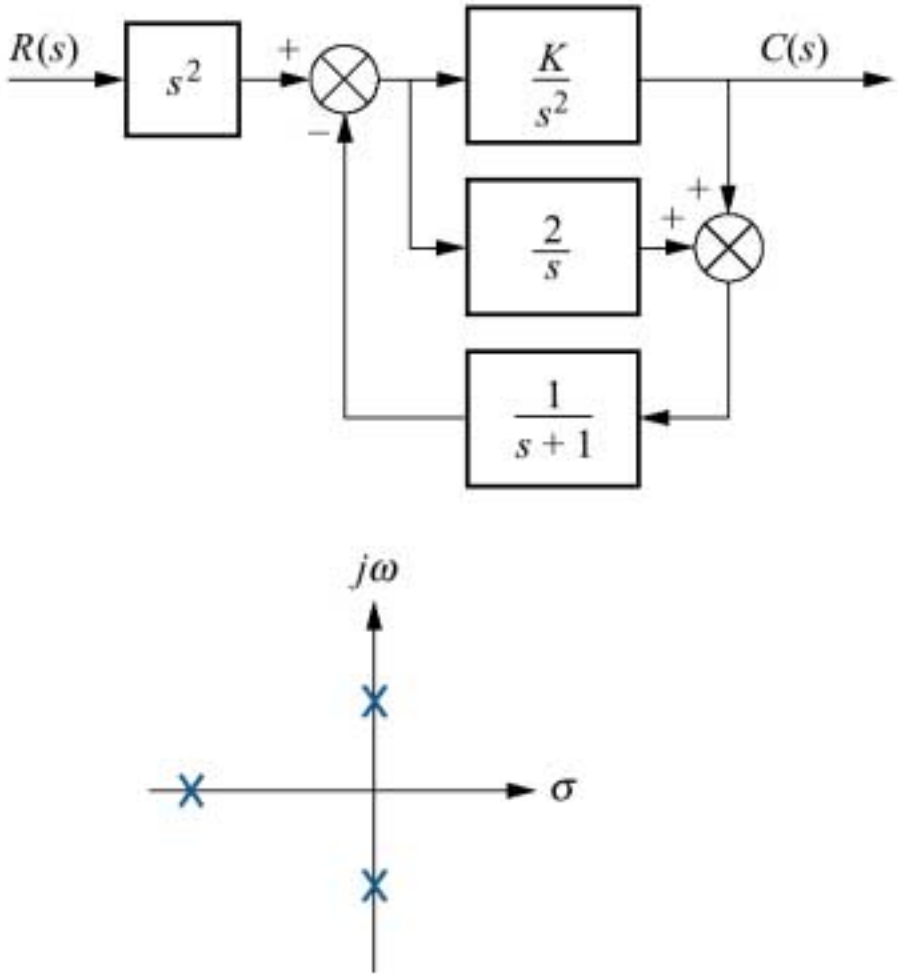


Figure P6.11
Aircraft pitch loop model

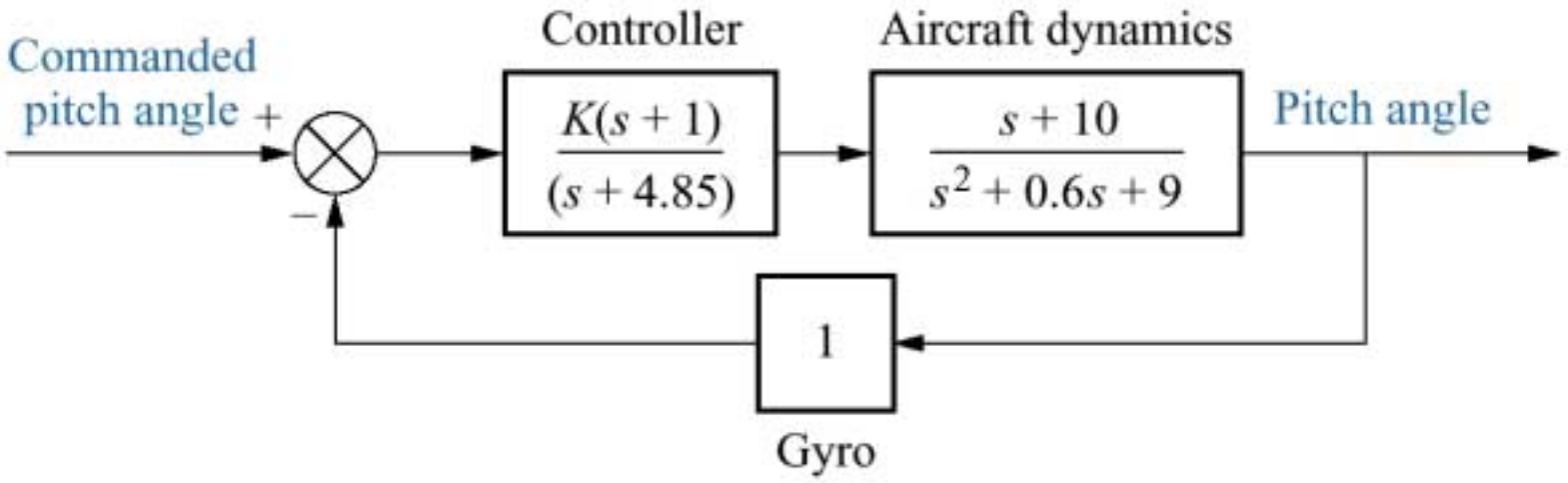


Figure P6.12
Block diagram of a chemical process-control system

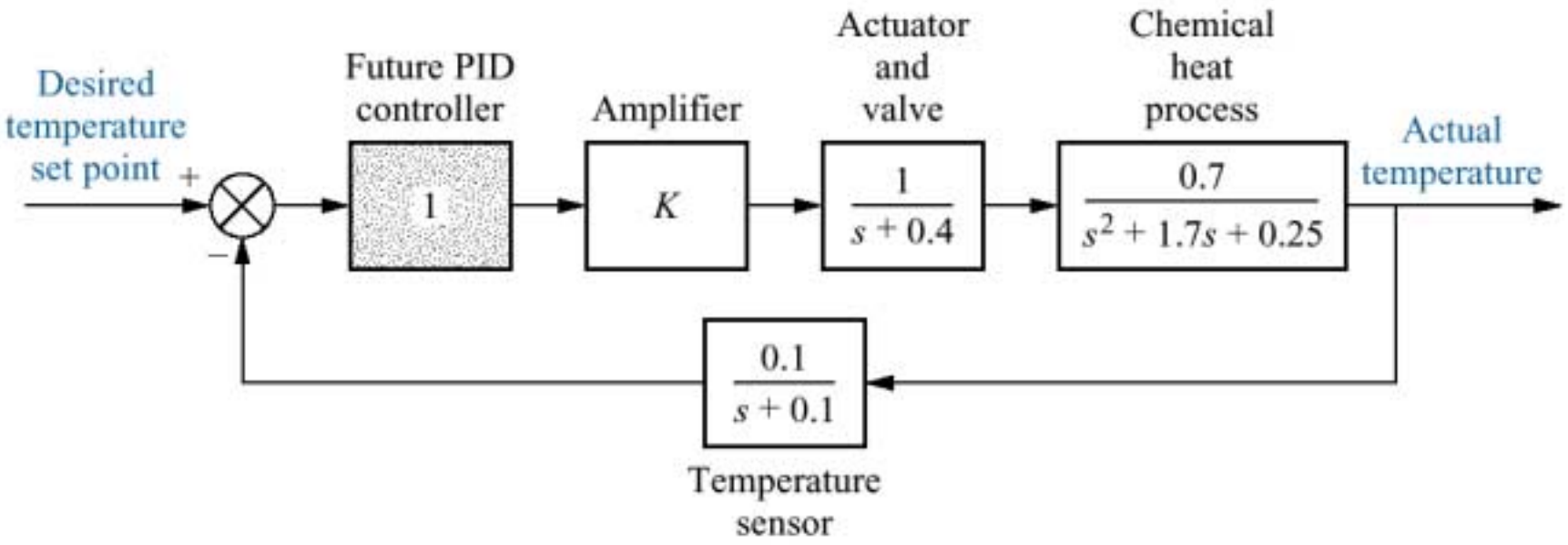
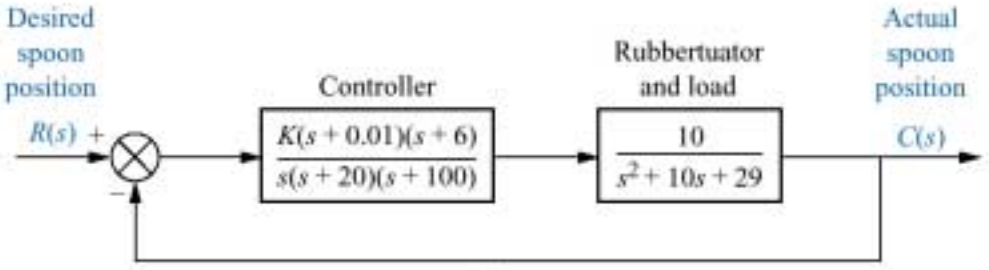


Figure P6.13
a. *Soft Arm* used for feeding;
b. simplified block diagram

(*a*)



(*b*)

Figure P6.14
Towed vehicle roll control

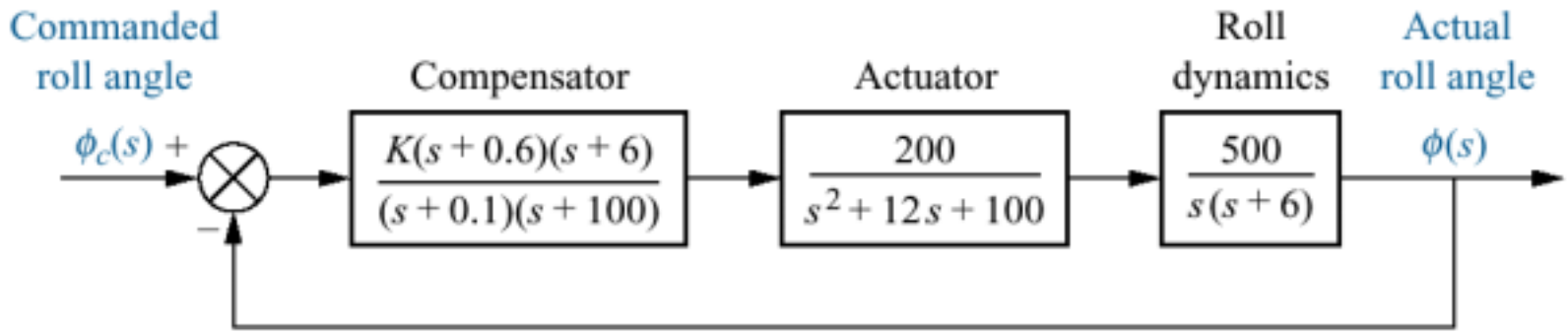


Figure P6.15
Cutting force control system

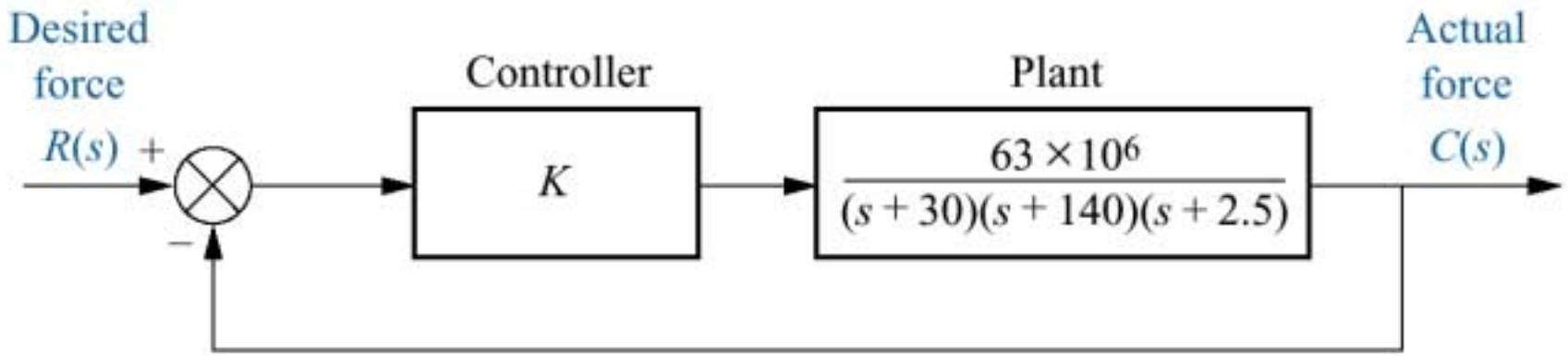
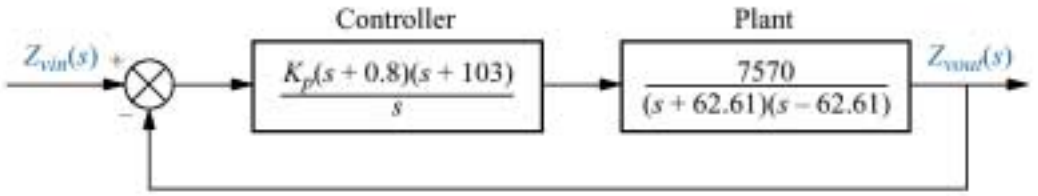


Figure P6.16
a. A magnetic levitation transportation system (©1998 IEEE);
b. simplified block diagram (©1998 IEEE)

(a)



(b)