Chapter 3

Modeling in the Time Domain

Figure 3.1
RL network

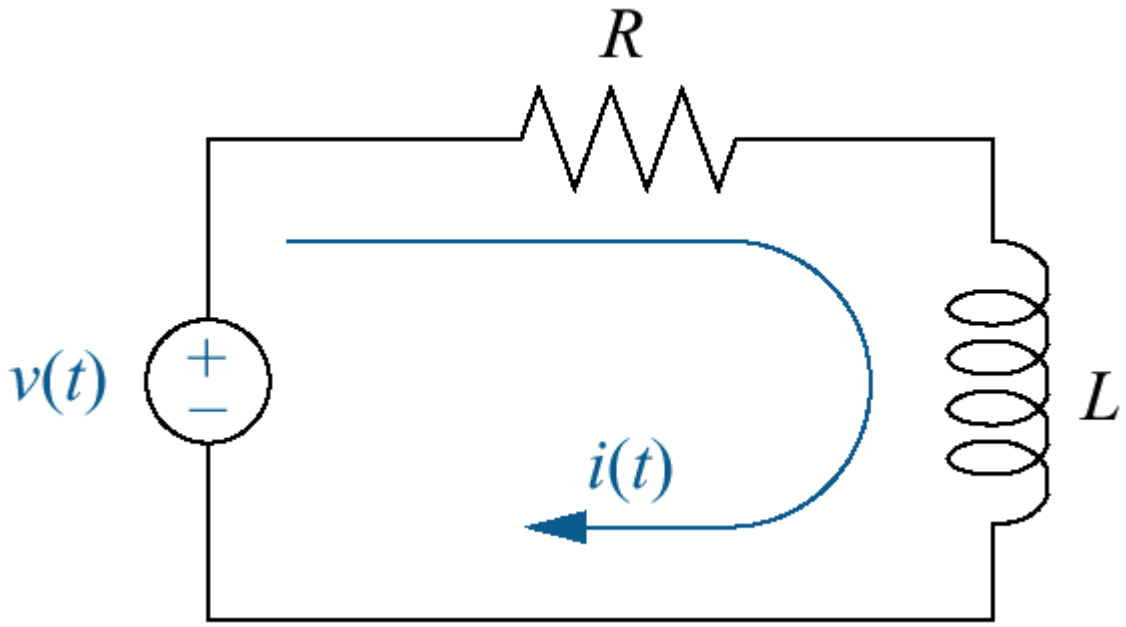


Figure 3.2
RLC network

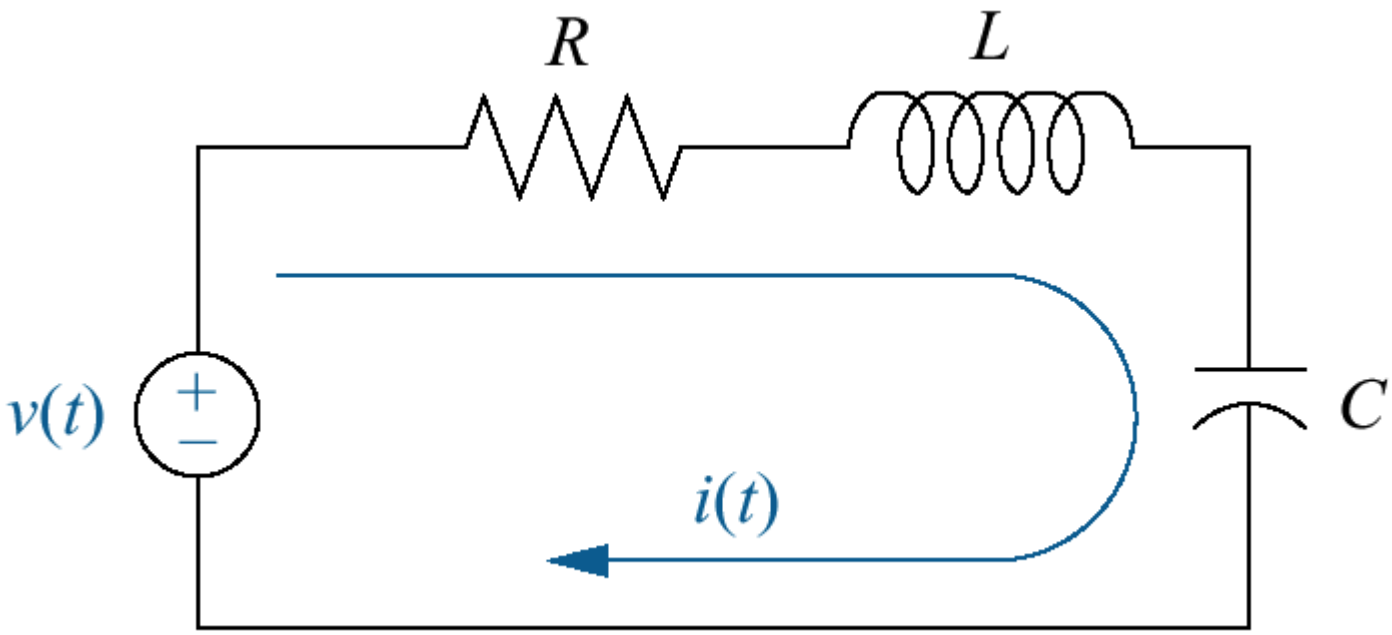


Figure 3.3
Graphic representation of state space and a state vector

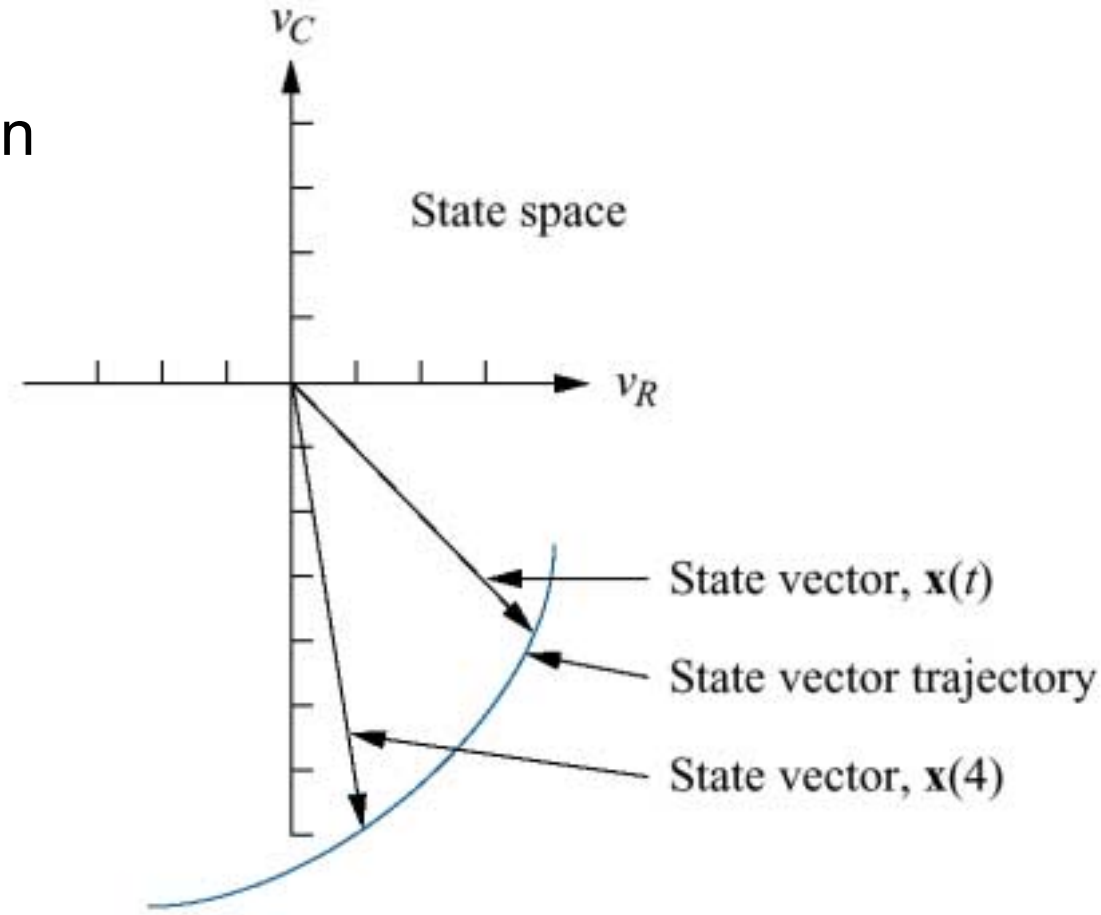


Figure 3.4
Block diagram of a mass and damper

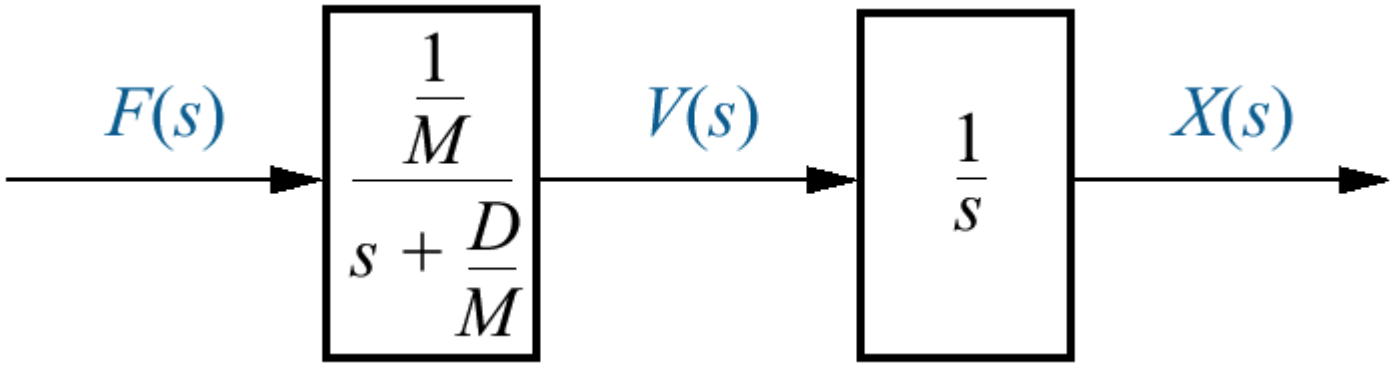


Figure 3.5
Electrical network for representation in state space

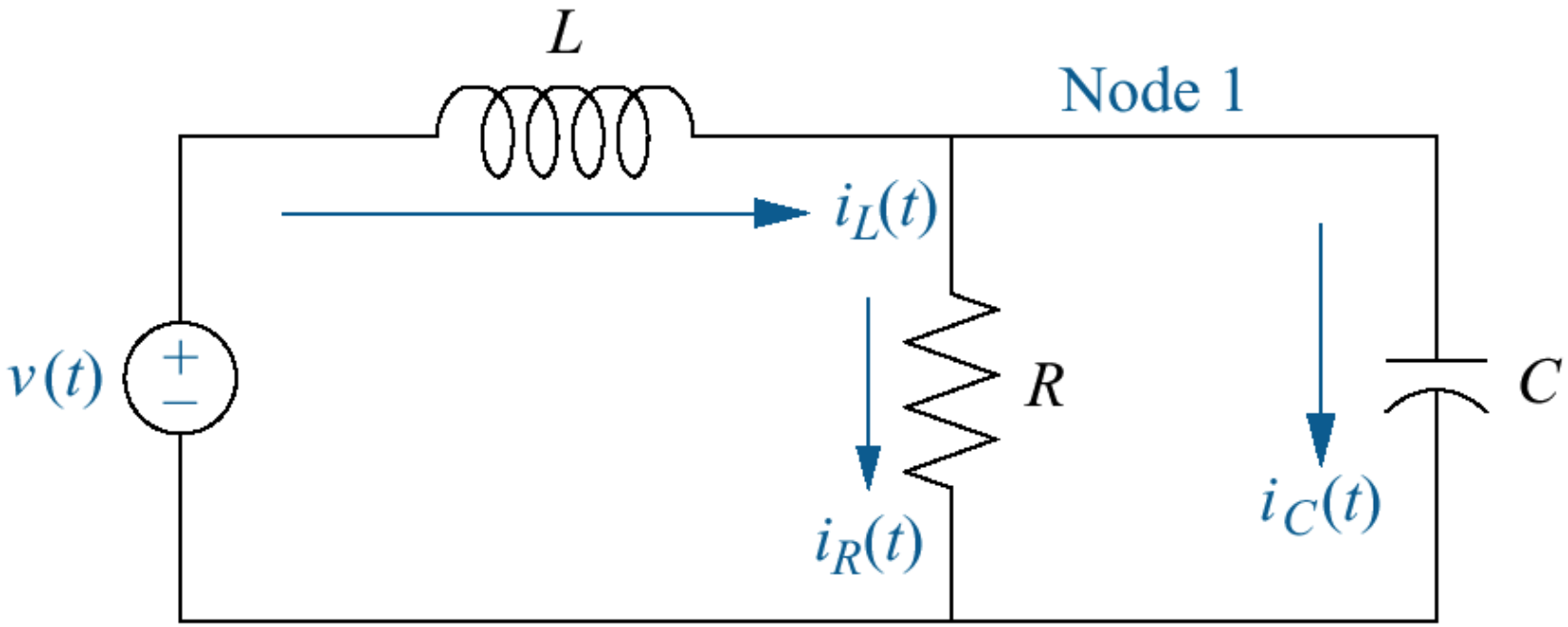


Figure 3.6
Electrical network for
Example 3.2

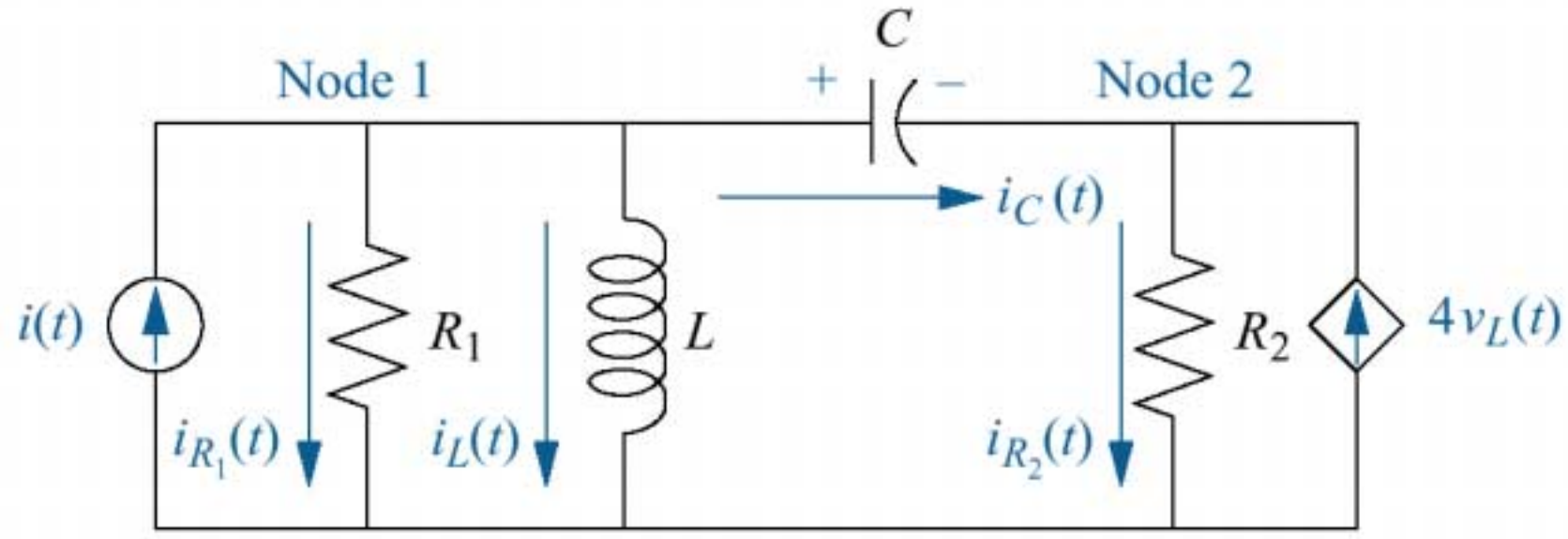


Figure 3.7
Translational mechanical system

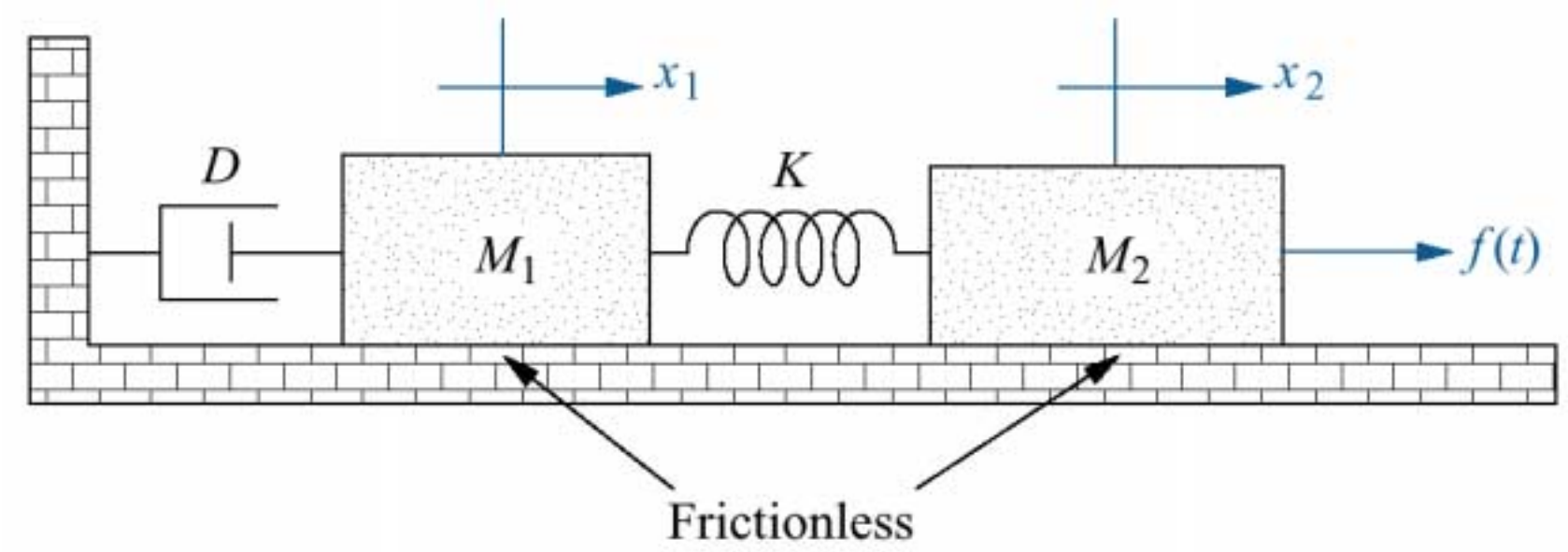


Figure 3.8
Electric circuit
for Skill-Assessment
Exercise 3.1

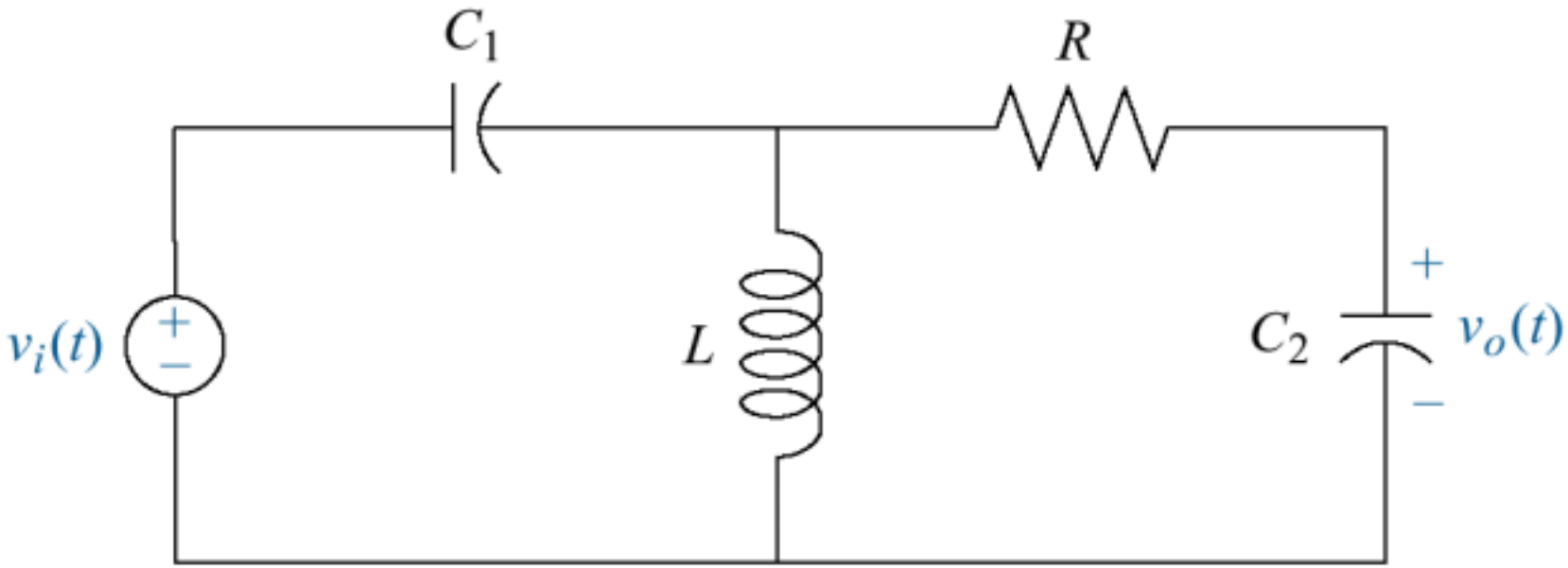


Figure 3.9
Translational mechanical system for Skill-Assessment Exercise 3.2

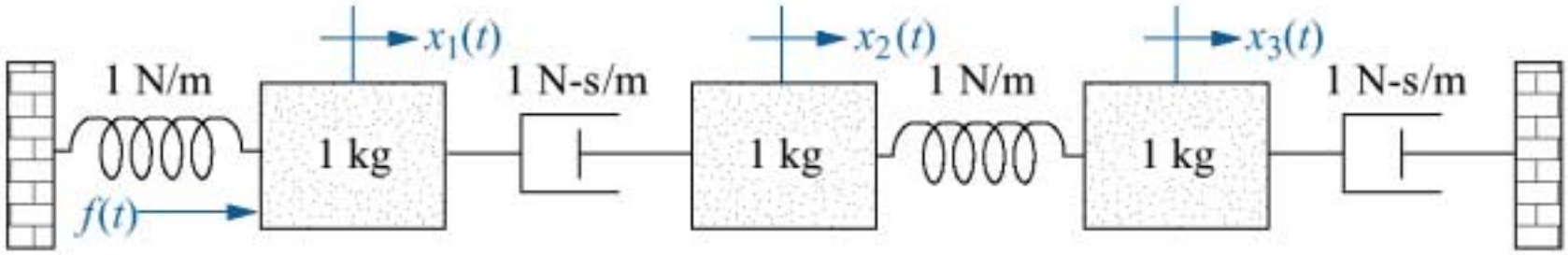


Figure 3.10
a. Transfer function;
b. equivalent block diagram showing phase-variables.
Note: y(t) = c(t)

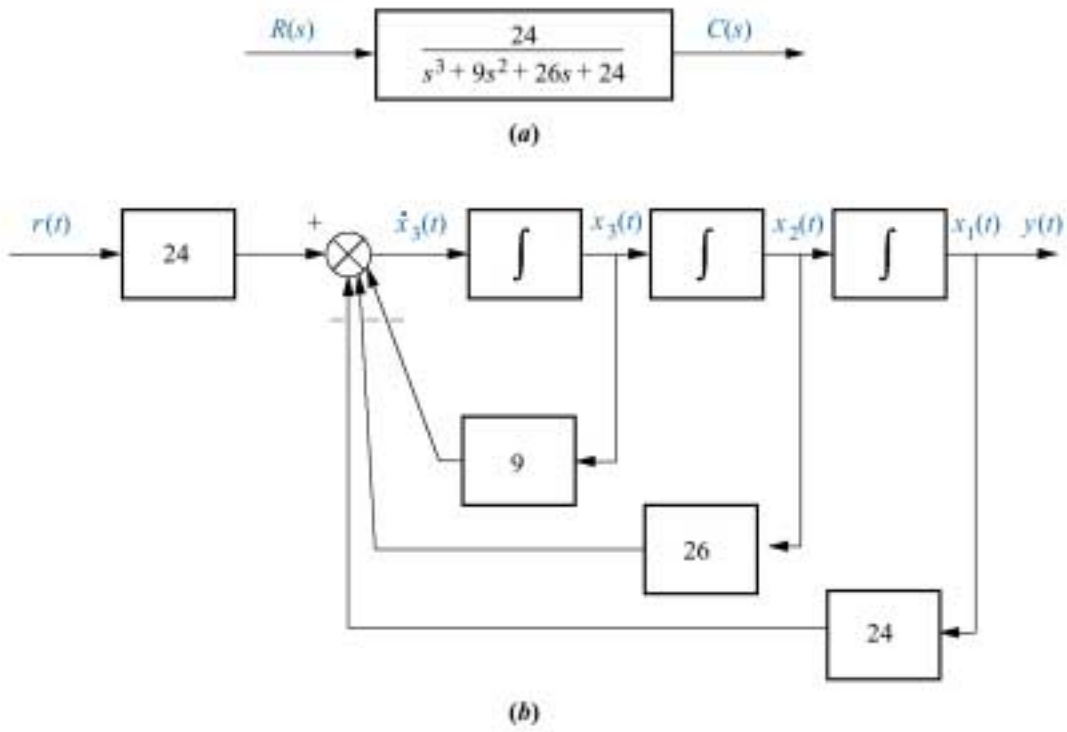


Figure 3.11
Decomposing a transfer function

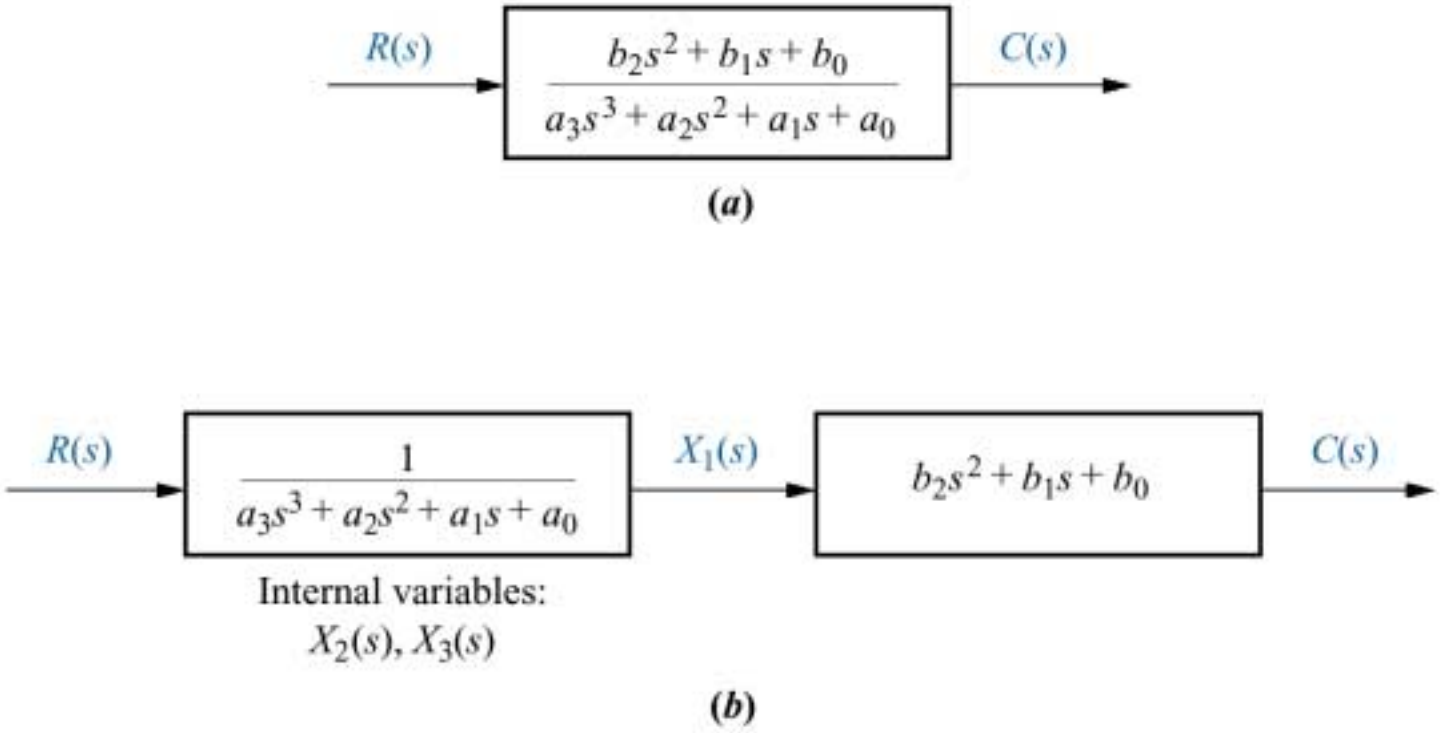


Figure 3.12
a. Transfer function;
b. decomposed transfer function;
c. equivalent block diagram. Note: y(t) = c(t)

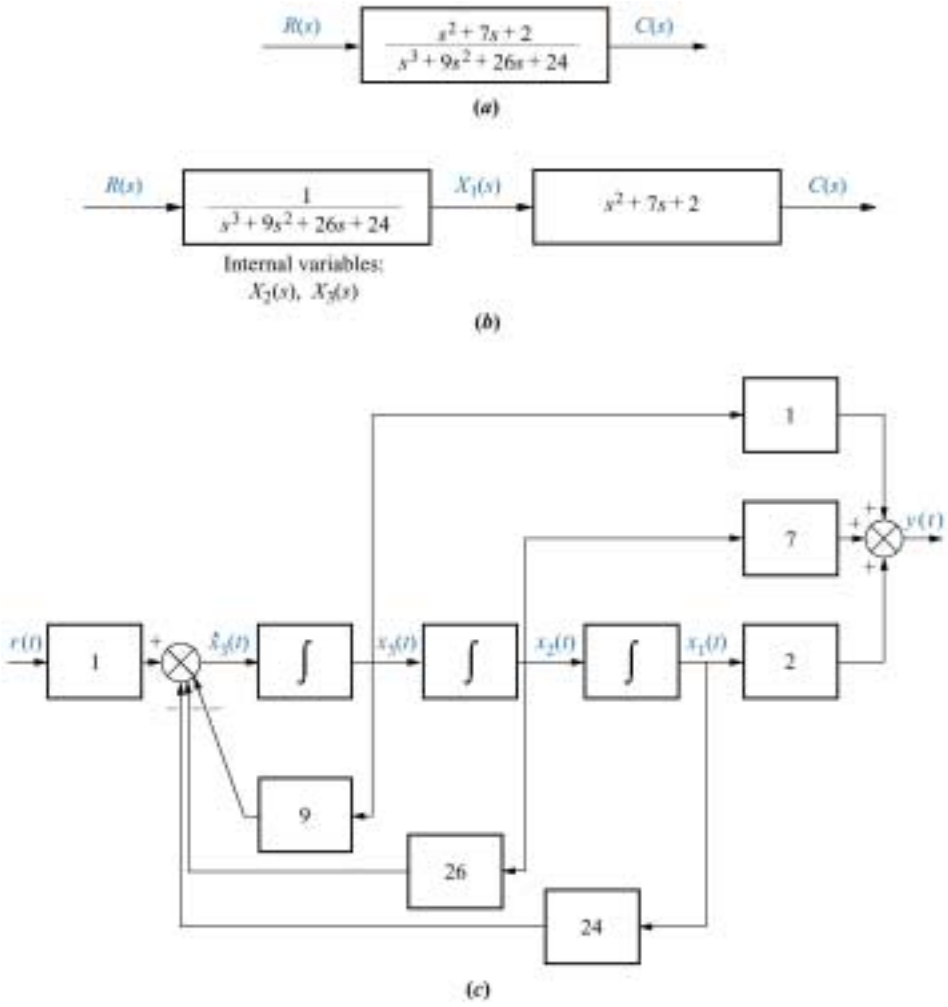


Figure 3.13
Walking robots, such as Hannibal shown here, can be used to explore hostile environments and rough terrain, such as that found on other planets or inside volcanoes.

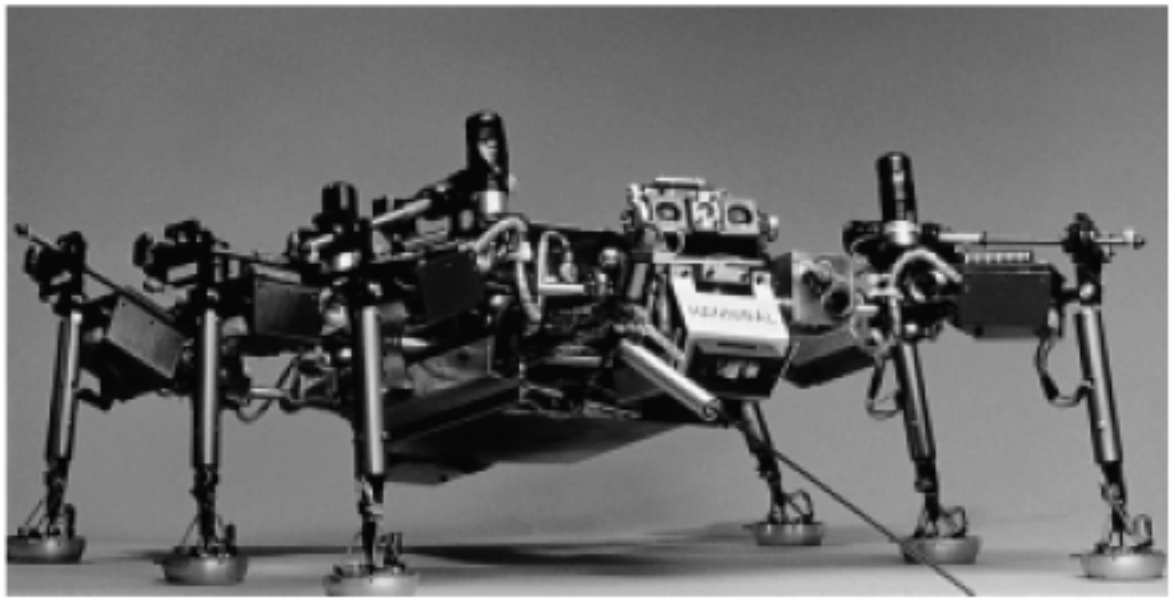


Figure 3.14
a. Simple pendulum;
b. force components of Mg;
c. free-body diagram

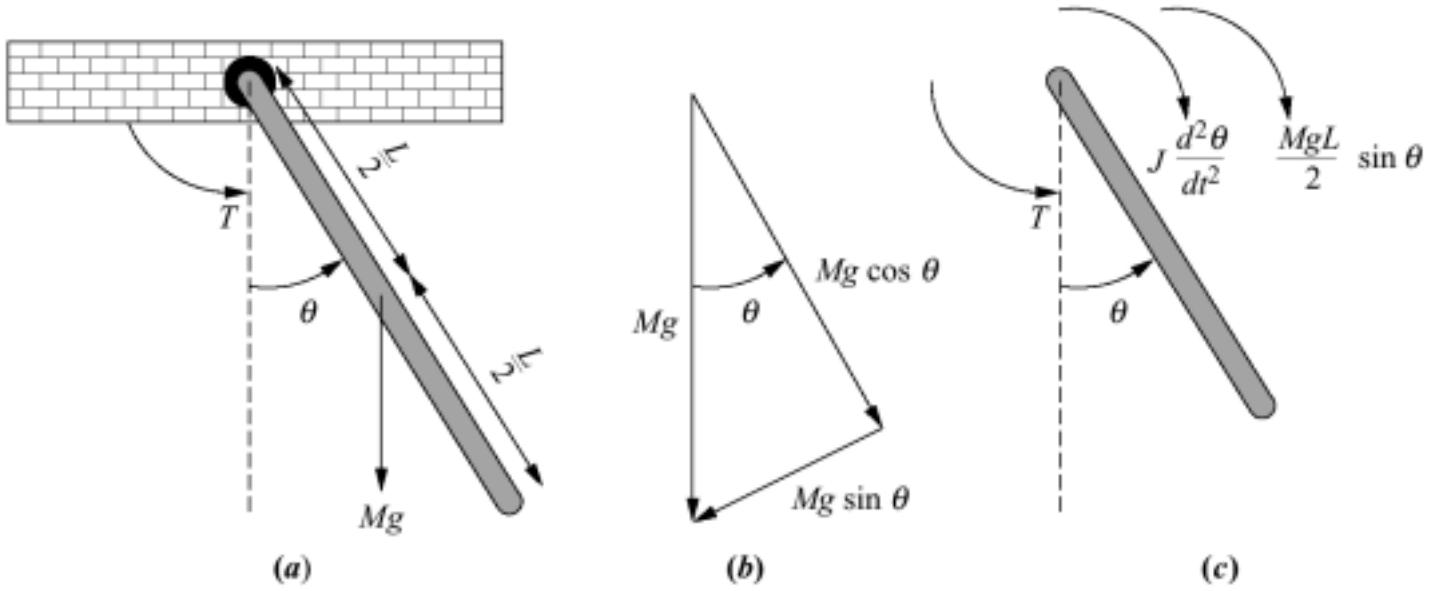


Figure 3.15
Nonlinear translational mechanical system for Skill-Assessment Exercise 3.5

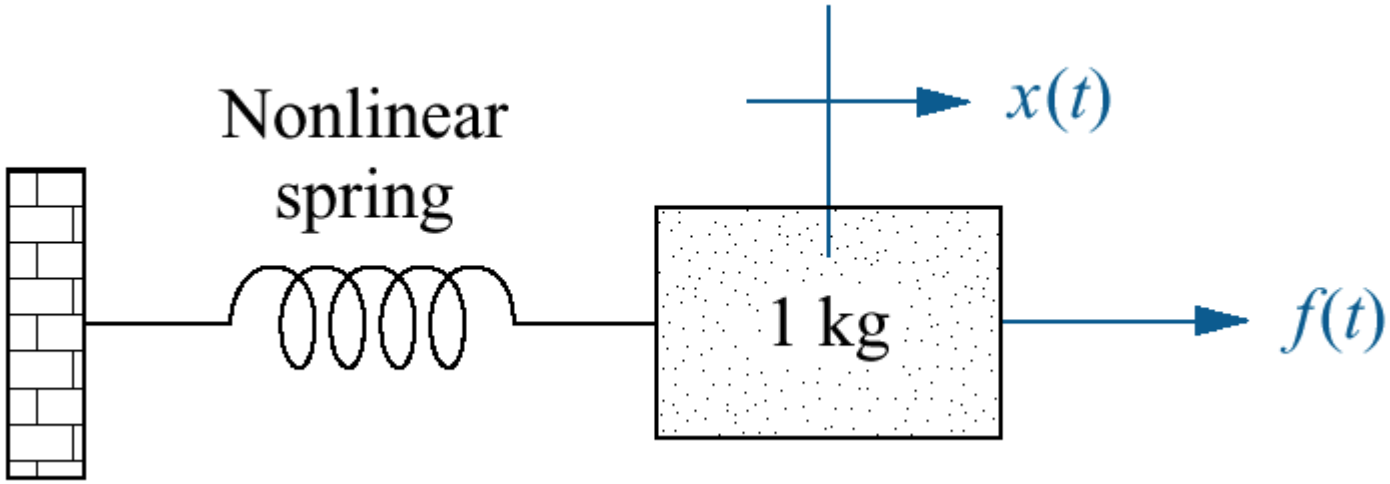


Figure 3.16
Pharmaceutical drug-level concentrations in a human

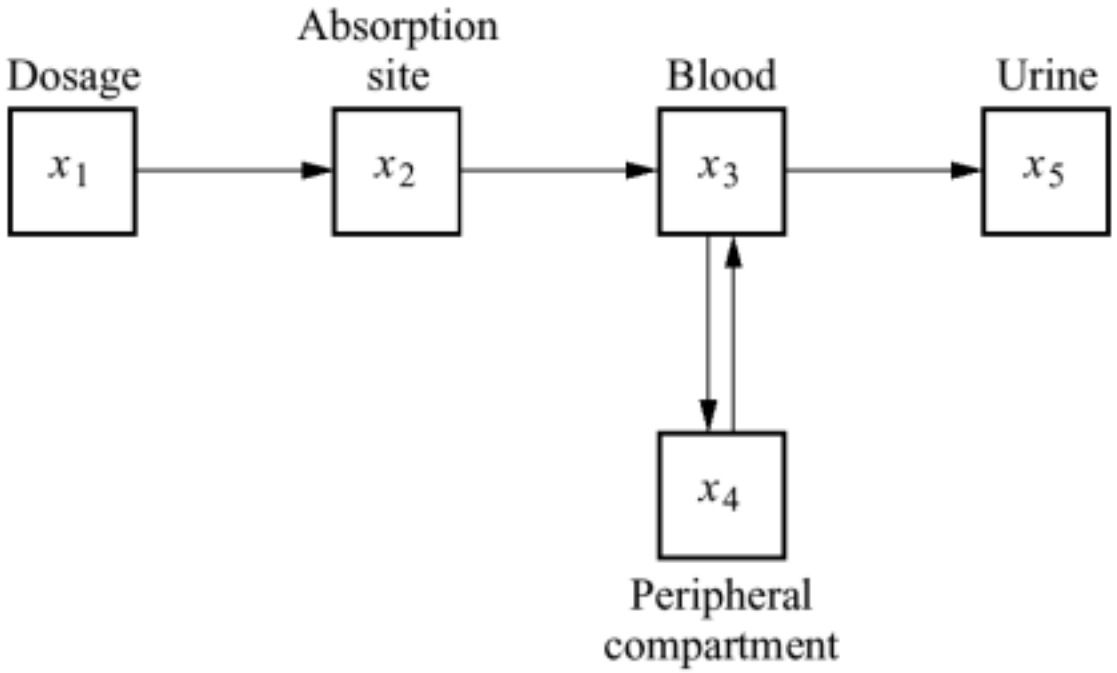


Figure 3.17
Aquifer system model

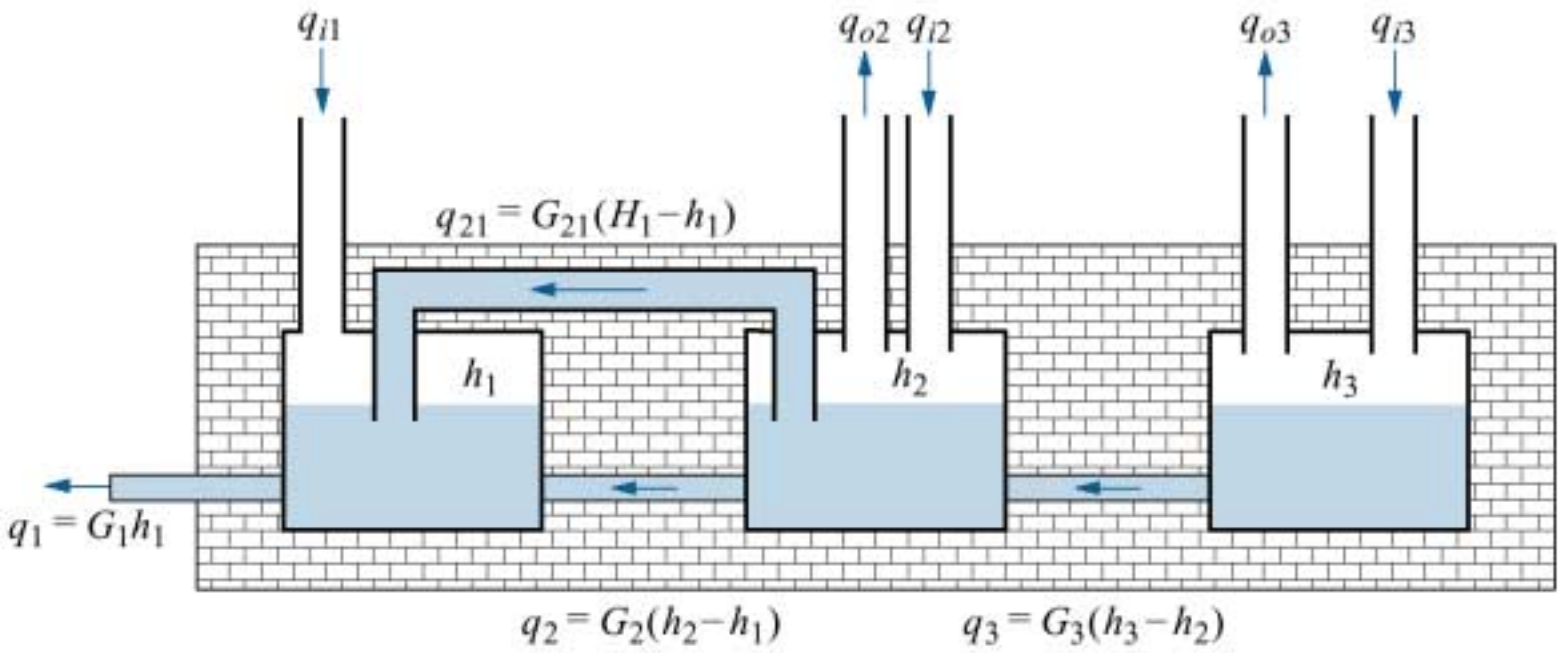


Figure P3.1

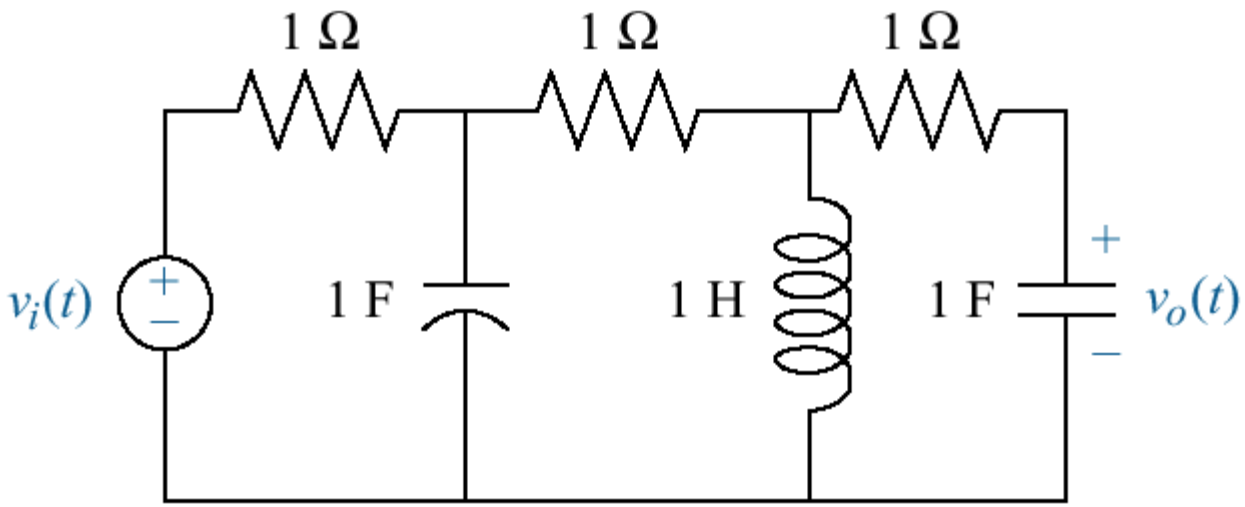


Figure P3.2

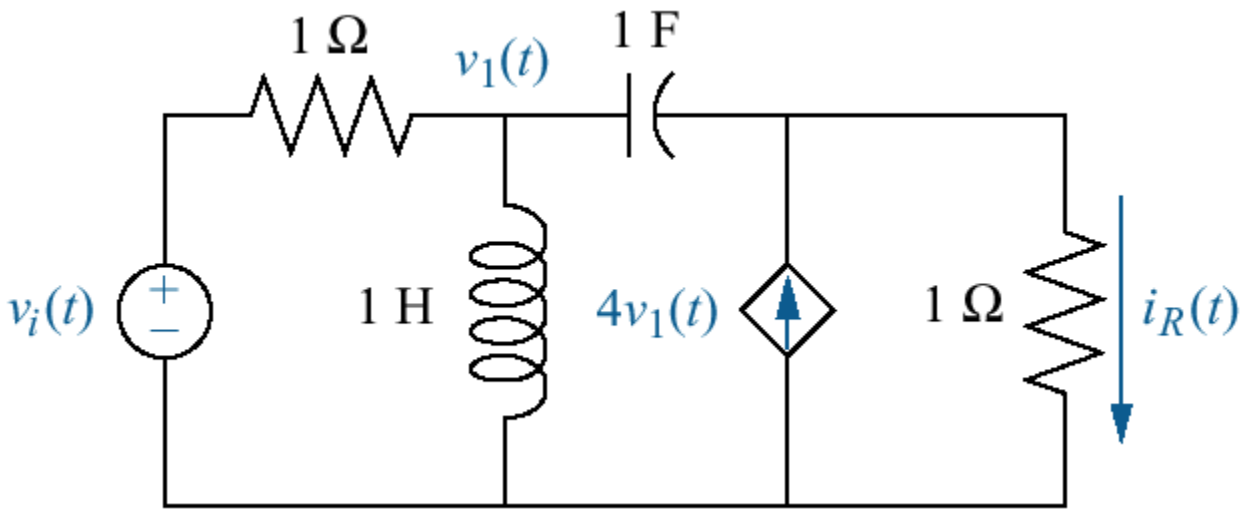


Figure P3.3

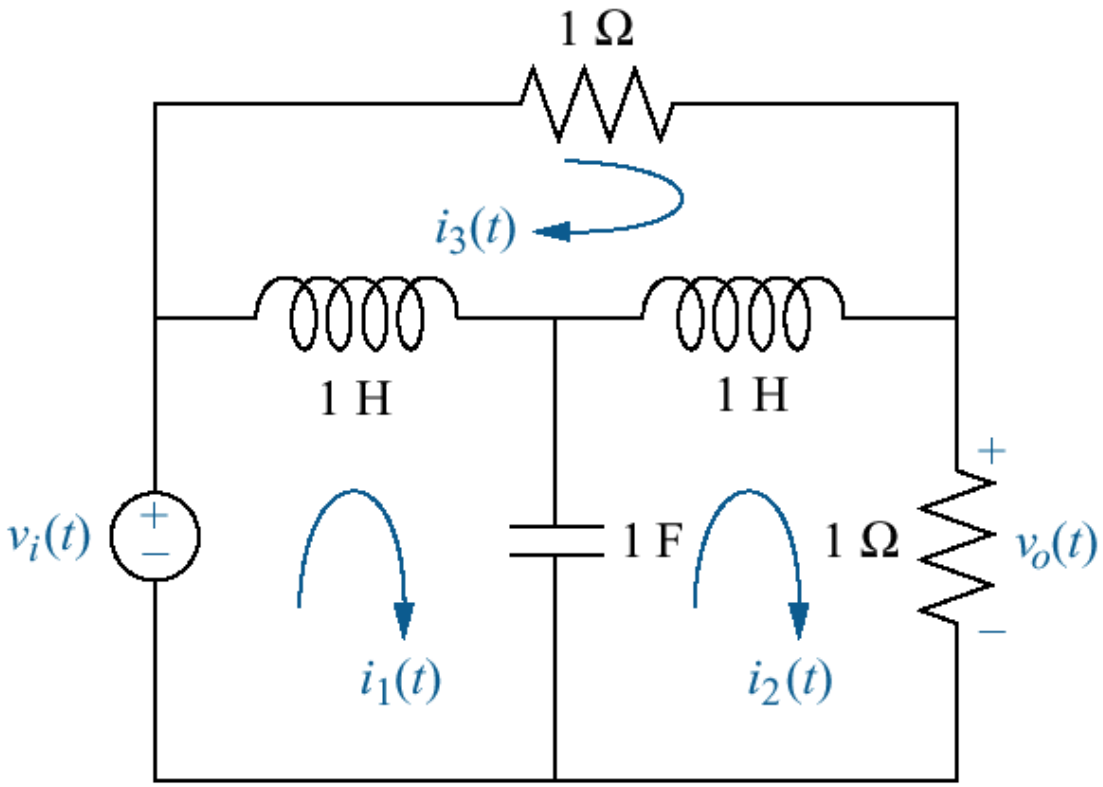


Figure P3.4

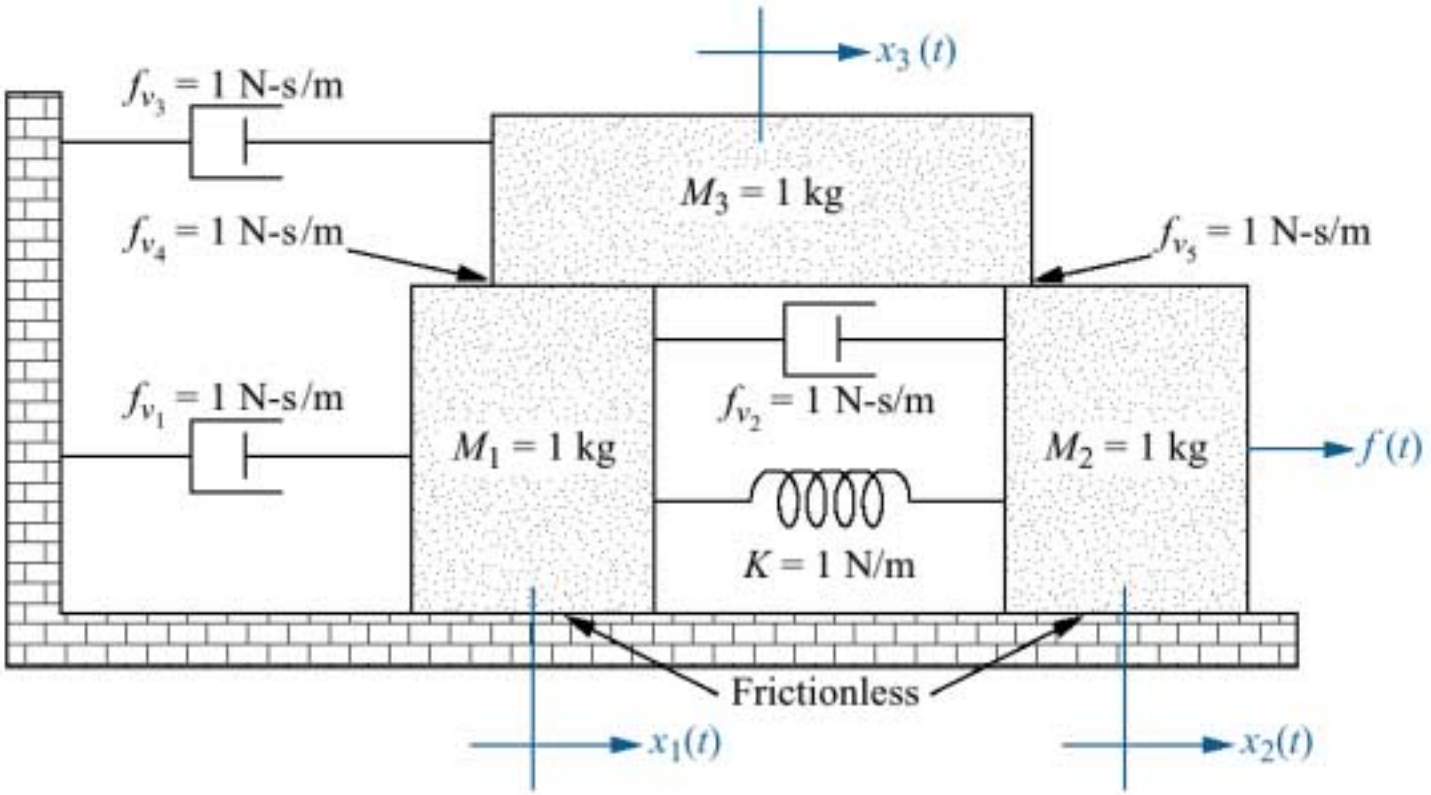


Figure P3.5

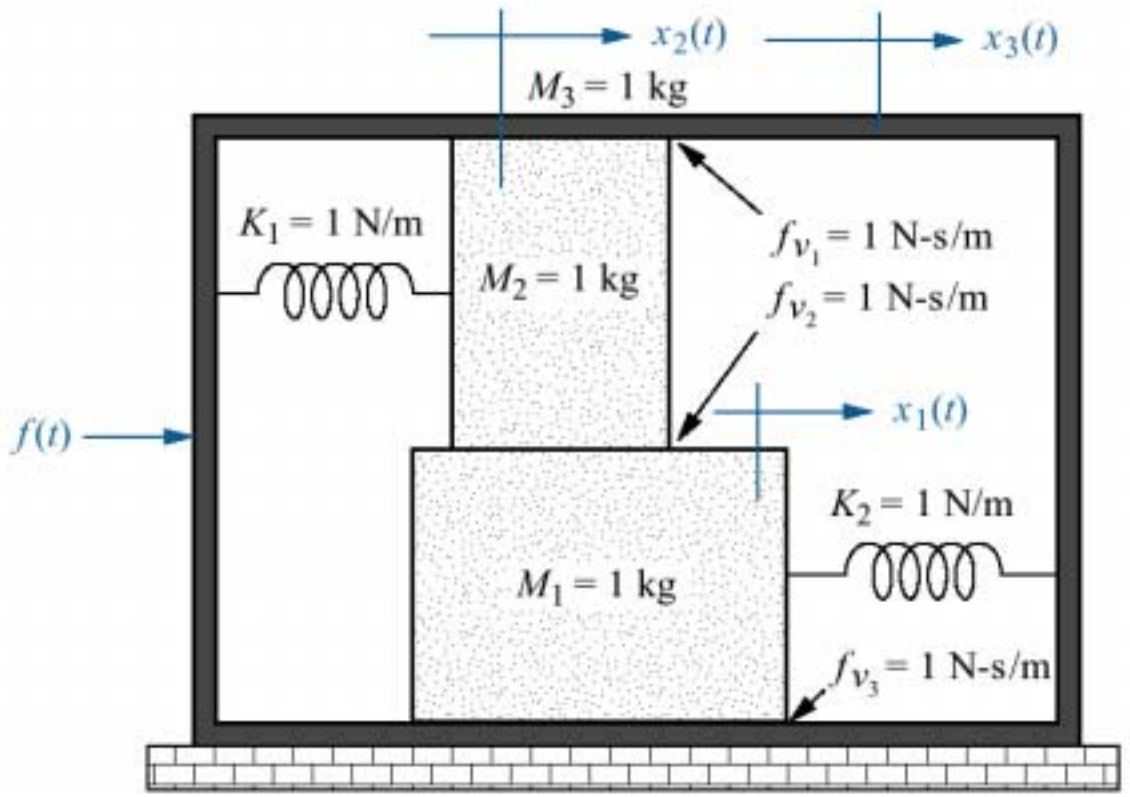


Figure P3.6

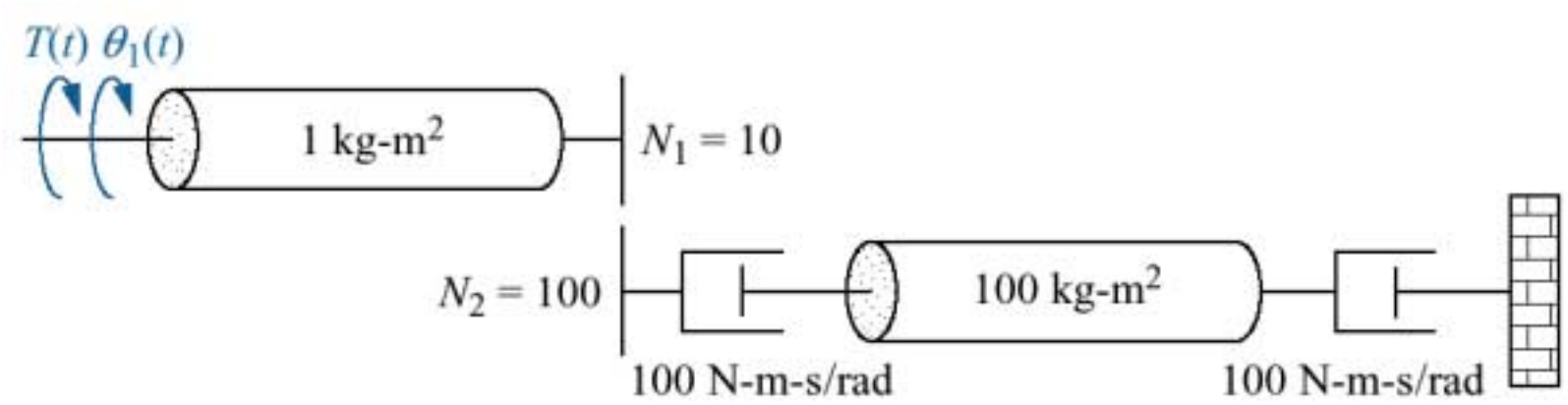


Figure P3.7

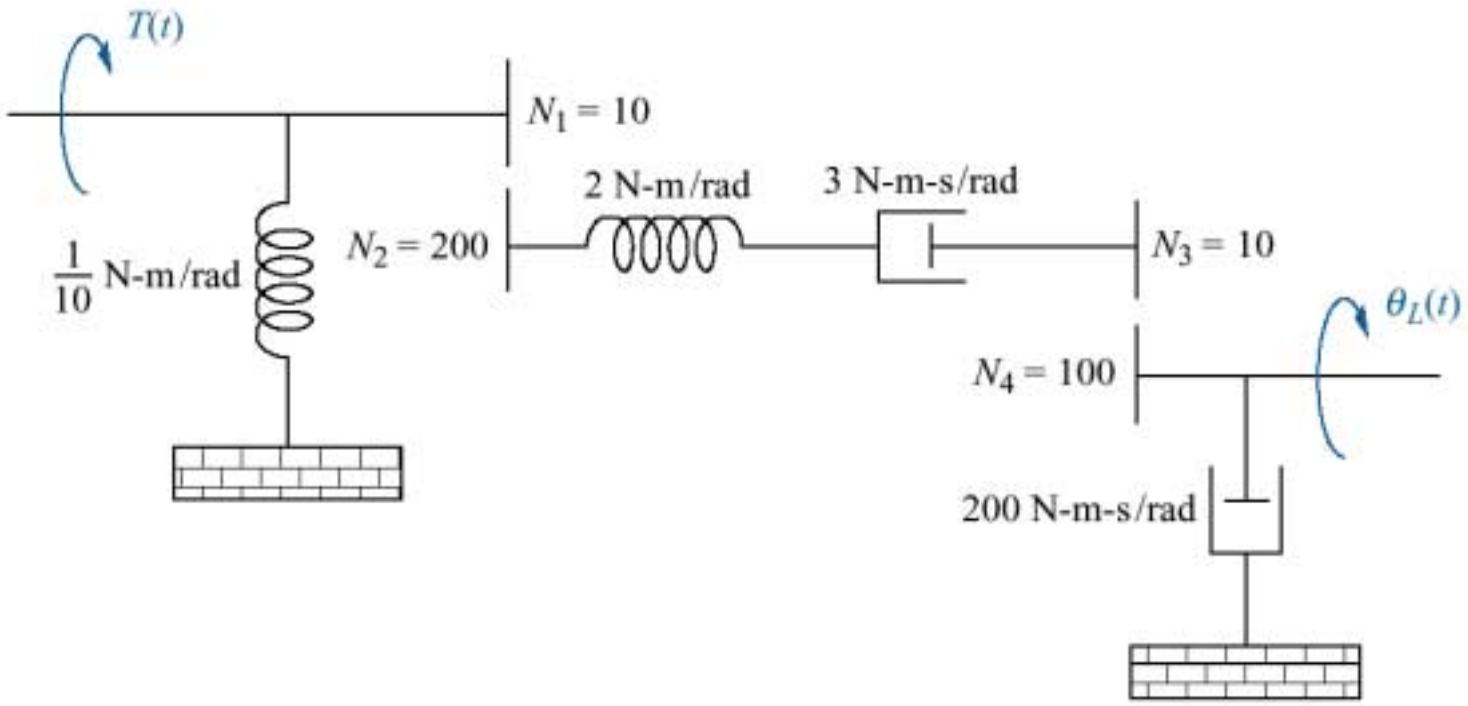
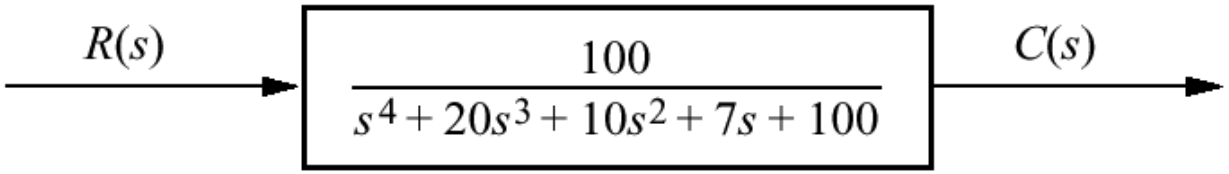
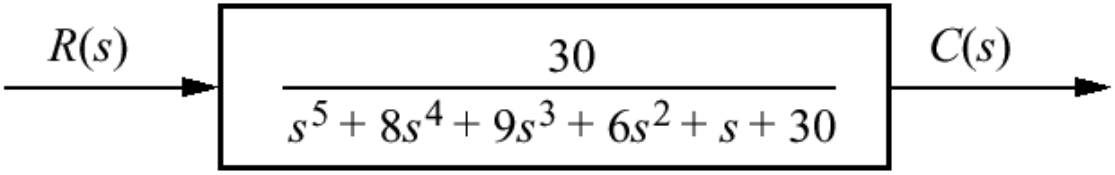


Figure P3.8

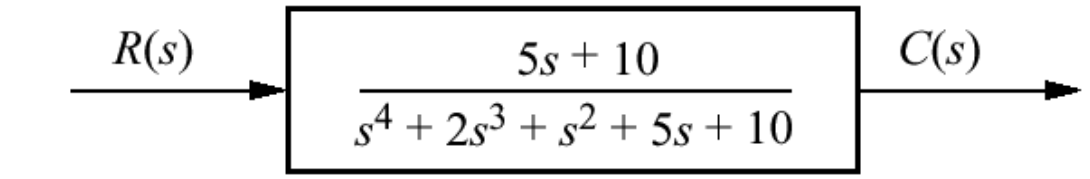


(a)

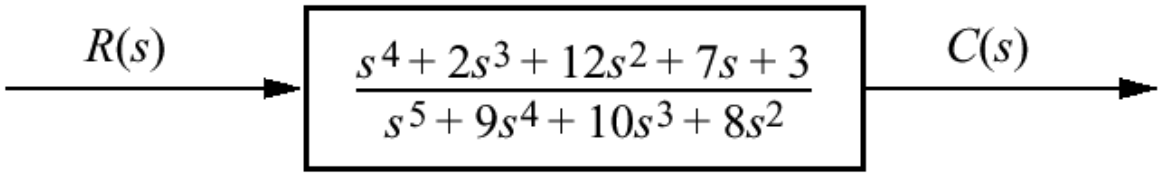


(b)

Figure P3.9



(a)



(b)

Figure P3.10
Gyro system

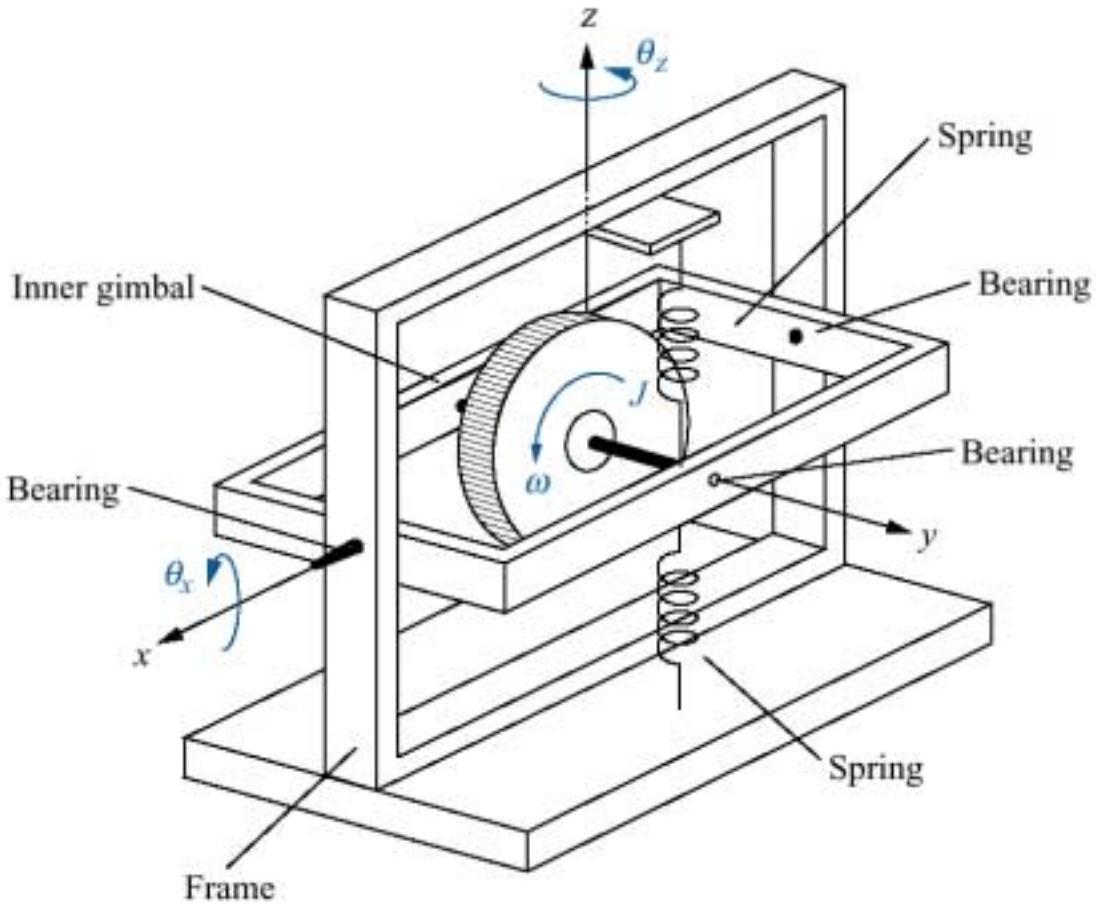


Figure P3.11
Missile

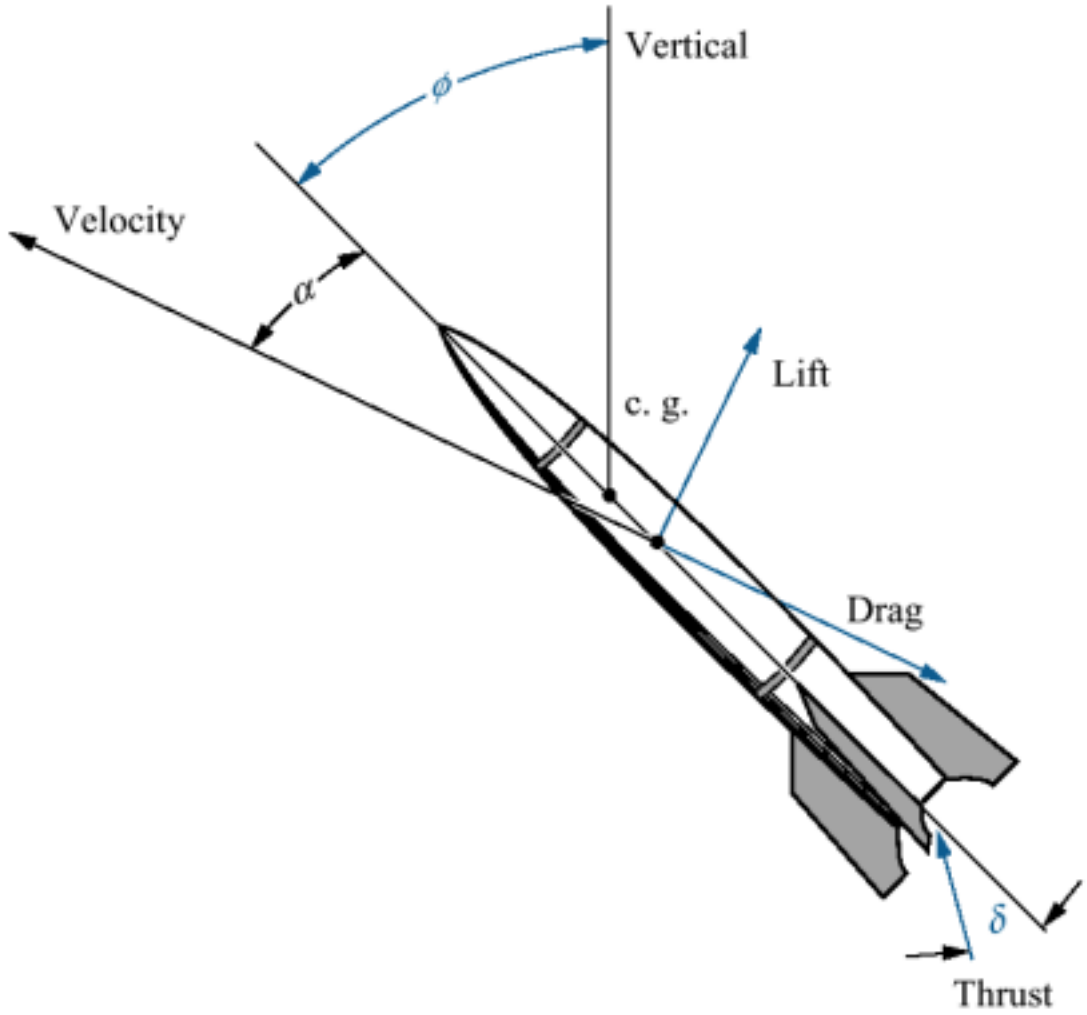


Figure P3.12
Motor and load

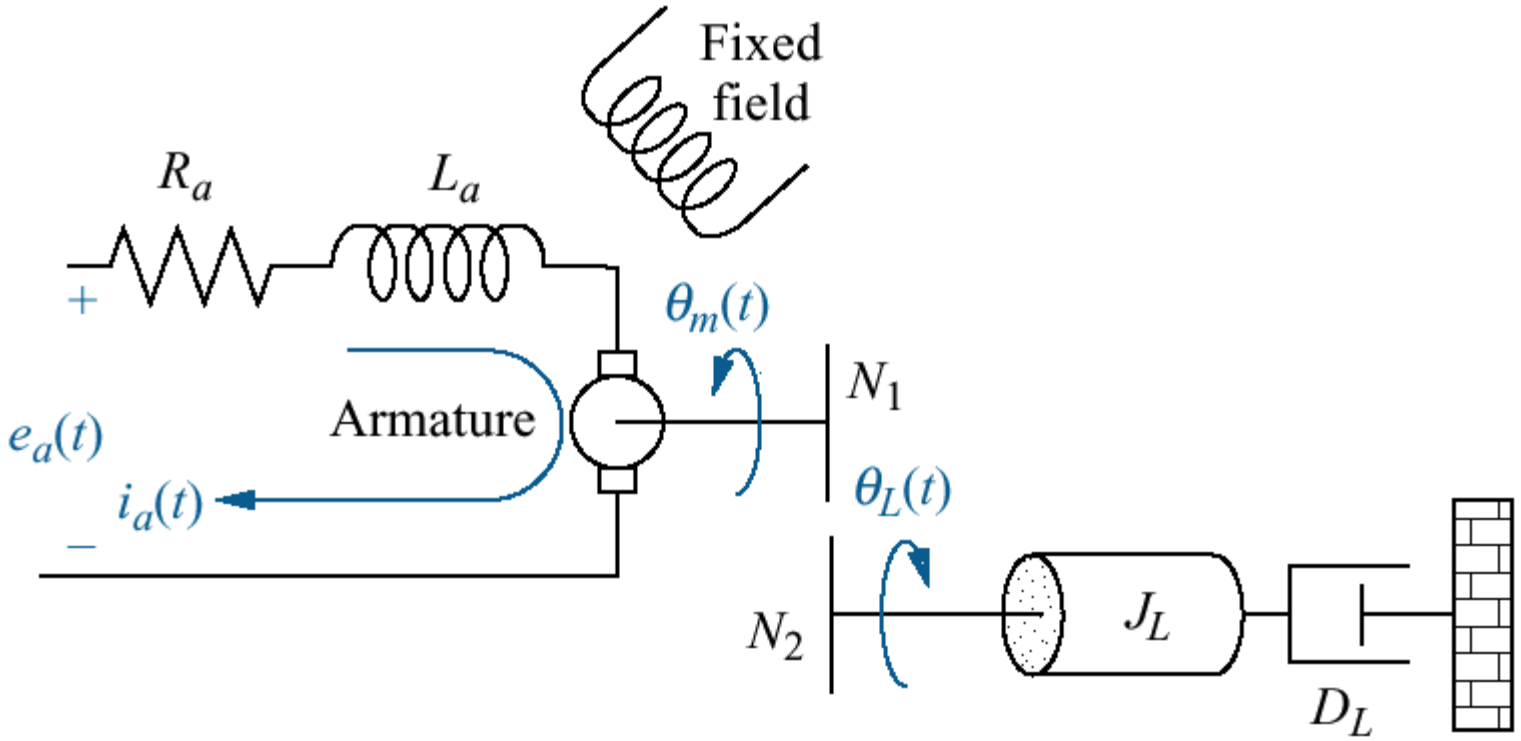


Figure P3.13
Nonlinear mechanical system

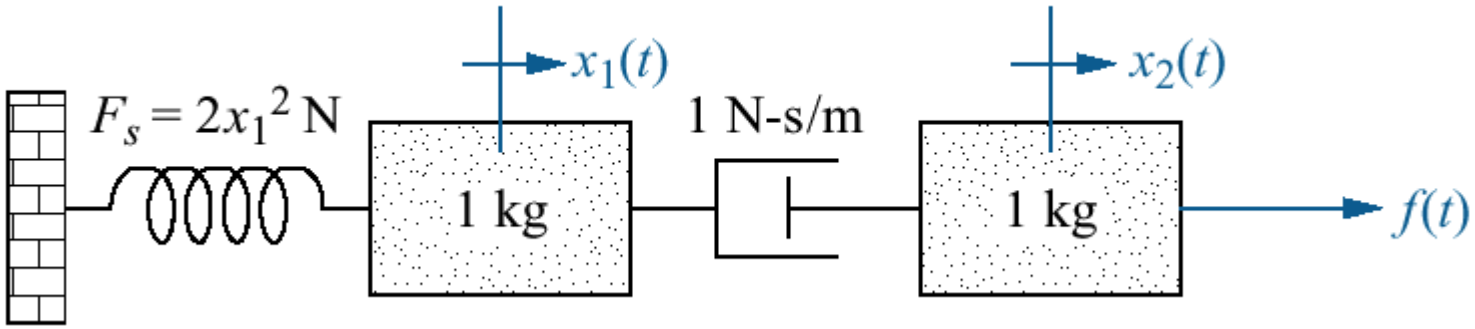


Figure P3.14
a. Robot with television imaging system (©1992 IEEE); **b.** vector diagram showing concept behind image-based homing (©1992 IEEE); **c.** heading control system

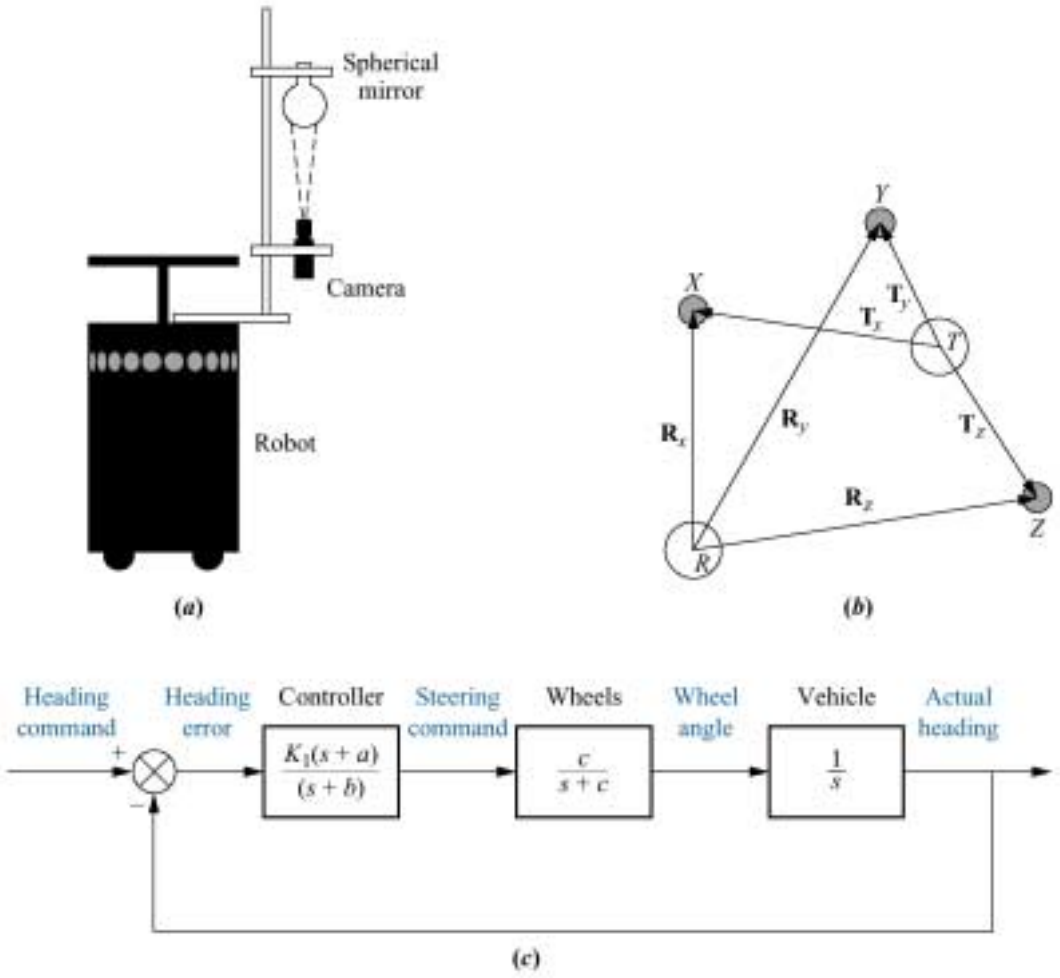


Figure P3.15
a. F4-E with canards (© 1992 AIAA);
b. open-loop flight control system (© 1992 AIAA)

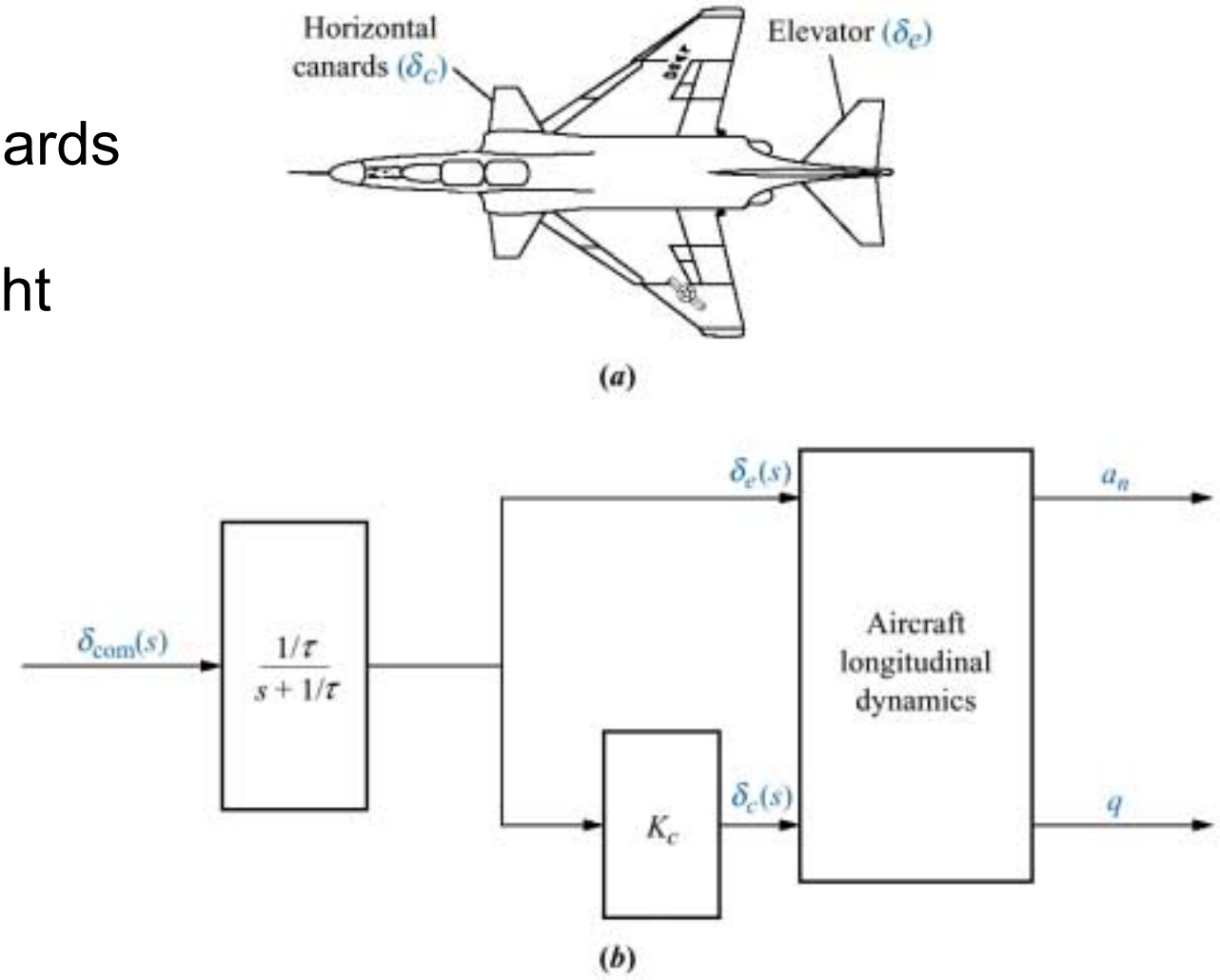


Figure P3.16
Robotic manipulator and target environment (©1992 IEEE)