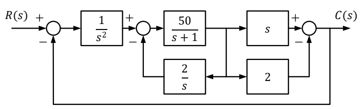
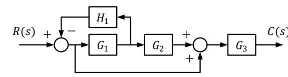
5.1 Reduce the block diagram to a single TF, $T(s) = C(s)/R(s)$. Use the following methods

a. Block diagram reduction

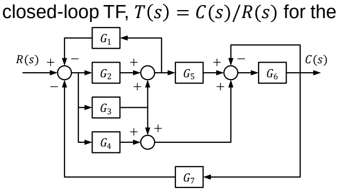
b. Matlab



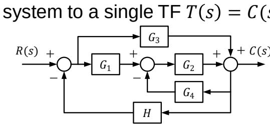
5.2 Find the equivalent TF, $T(s) = C(s)/R(s)$ for the system using block diagram reduction TF



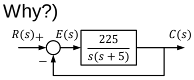
5.3 Find the closed-loop TF, $T(s) = C(s)/R(s)$ for the system



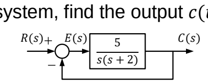
5.4 Reduce the system to a single TF $T(s) = C(s)/R(s)$



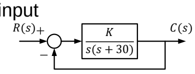
5.11 For the given system, find the percent overshoot, settling time, and peak time for a step input if the system's response is underdamped. (Is it? Why?)



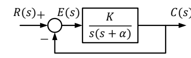
5.12 For the given system, find the output $c(t)$ if the input $r(t)$ is a unit step



5.14 For the given system, find the value of K that yields 10% overshoot for a step input



5.15 For the given system, find K and a to yield a settling time of $0.15s$ and a 30% overshoot



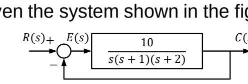
5.31 Represent the systems below in state space in phase-variable form. Draw the signal-flow graphs

a. $G(s) = \dfrac{s+3}{s^2+2s+7}$

b. $G(s) = \dfrac{s^2+2s+6}{3s^3+5s^2+2s+1}$

c. $G(s) = \dfrac{s^3+2s^2+7s+1}{s^4+3s^3+5s^2+6s+4}$

5.34 You are given the system shown in the figure



a. Represent the system in state space in phase variable form

b. Represent the system in state space in any other form besides phase-variable

5.39 Given a unity feedback system with the forward-path TF

$$G(s) = \frac{7}{s(s+9)(s+12)}$$

use matlab to represent the closed loop system in state space in

a. phase-variable form

b. parallel form

5.45 Diagonalize the following system

$$\dot{\boldsymbol{x}} = \begin{bmatrix} -5 & -5 & 4 \\ 2 & 0 & -2 \\ 0 & -2 & -1 \end{bmatrix}\boldsymbol{x} + \begin{bmatrix} -1 \\ 2 \\ -2 \end{bmatrix} r,\ y = \begin{bmatrix} -1 & 1 & 2 \end{bmatrix}\boldsymbol{x}$$