Tutorial 4

Problem 1

8. Given the block diagram of a system shown in Figure P5.8, find the transfer function $G(s) = \theta_{22}(s)/\theta_{11}(s)$. [Section: 5.2]

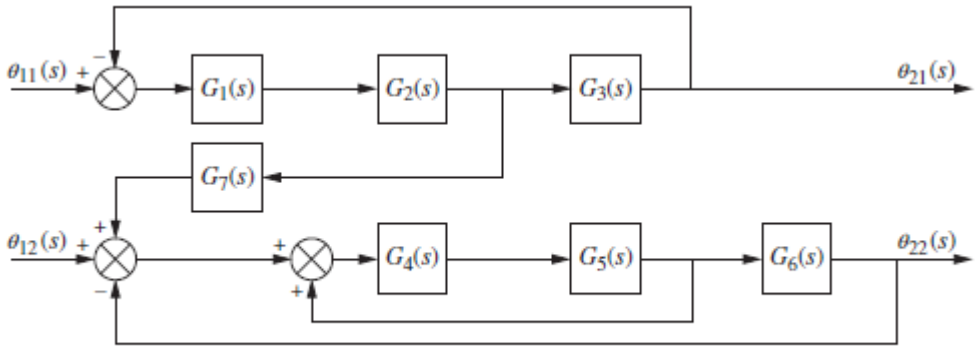
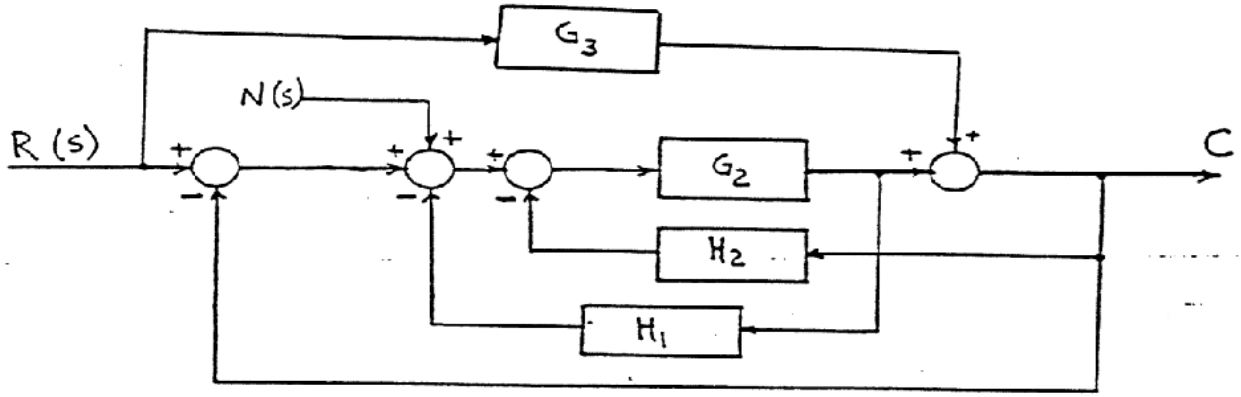
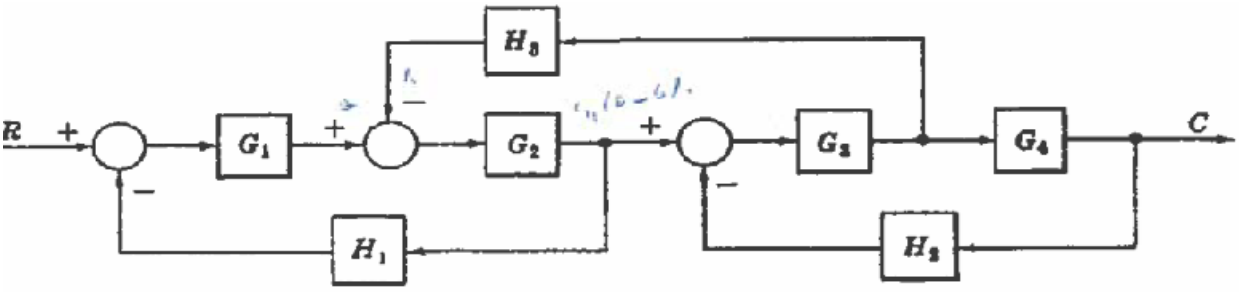


FIGURE P5.8

Problem2. Draw the signal flow graph and use Mason's formula to derive the transfer function C(s)/R(s)



Problem3. Draw the signal flow graph and use Mason's formula to derive the transfer function C(s)/R(s).



Problem 4

23. Draw a signal-flow graph for each of the following state equations: [Section: 5.6]

State Space
SS

a. $$\dot{\mathbf{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -4 & -6 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} r$$
$$y = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix} \mathbf{x}$$

b. $$\dot{\mathbf{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -3 & 1 \\ -3 & -4 & -5 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} r$$
$$y = \begin{bmatrix} 1 & 2 & 0 \end{bmatrix} \mathbf{x}$$

c. $$\dot{\mathbf{x}} = \begin{bmatrix} 7 & 1 & 0 \\ -3 & 2 & -1 \\ -1 & 0 & 2 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} r$$
$$y = \begin{bmatrix} 1 & 3 & 2 \end{bmatrix} \mathbf{x}$$