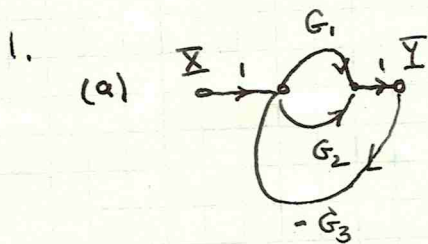
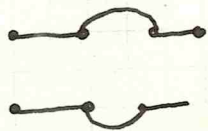


Hw 3 solutions:



(b) Forward path:



$$P_1 = G_1$$

$$P_2 = G_2$$

Loop:



$$L_1 = -G_1 G_3$$



$$L_2 = -G_2 G_3$$

disregard  $L_1, L_2$

$$\Delta = 1 - (L_1 + L_2)$$

$$\Delta_1 = 1$$

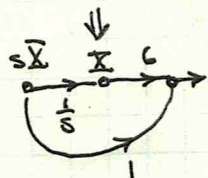
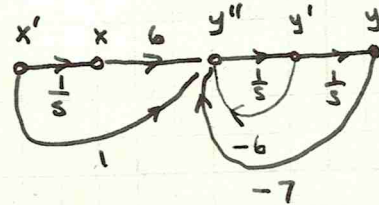
$$\Delta_2 = 1$$

$$\frac{Y}{X} = \frac{P_1 \Delta_1 + P_2 \Delta_2}{\Delta}$$

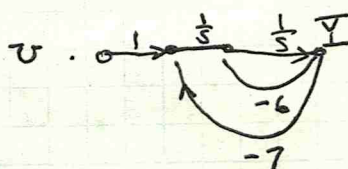
2.

(a)

$$y'' = -6y' - 7y + x'' + x6$$



$$\Rightarrow (sX) \frac{1}{s} 6 + sX = X6 + sX = X(s+6)$$



$$U = X(s+6)$$

Fwd Path:  $P_1 = \frac{1}{s^2} \} \Delta_1 = 1$

Loops

$$L_1 = -\frac{6}{s}$$

$$L_2 = -\frac{7}{s}$$

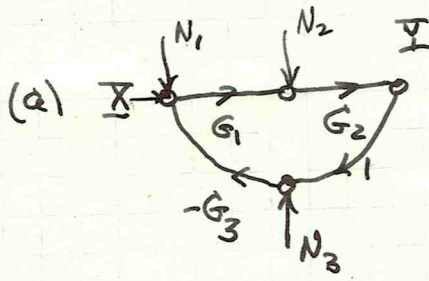
$$\Delta = 1 - (L_1 + L_2)$$

$$\frac{Y}{U} = \frac{P_1 \Delta_1}{\Delta}$$

$$\frac{Y}{X(s+6)} = \frac{P_1 \Delta_1}{\Delta}$$

$$\boxed{\frac{Y}{X} = (s+6) \frac{P_1 \Delta_1}{\Delta}}$$

3



$$V = \begin{bmatrix} V \\ X \end{bmatrix} X + \begin{bmatrix} V \\ N_1 \end{bmatrix} N_1 + \begin{bmatrix} V \\ N_2 \end{bmatrix} N_2 + \begin{bmatrix} V \\ N_3 \end{bmatrix} N_3$$

Loops:

$$L_1 = G_1 G_2 (-G_3)$$

$$D = 1 - L_1$$

$$\frac{V}{X} = \frac{G_1 G_2 (1)}{D}$$

$$\frac{V}{N_1} = \frac{G_1 G_2 (1)}{D}$$

$$\frac{V}{N_2} = \frac{G_2 (1)}{D}$$

$$\frac{V}{N_3} = \frac{-G_3 G_1 G_2 (1)}{D}$$