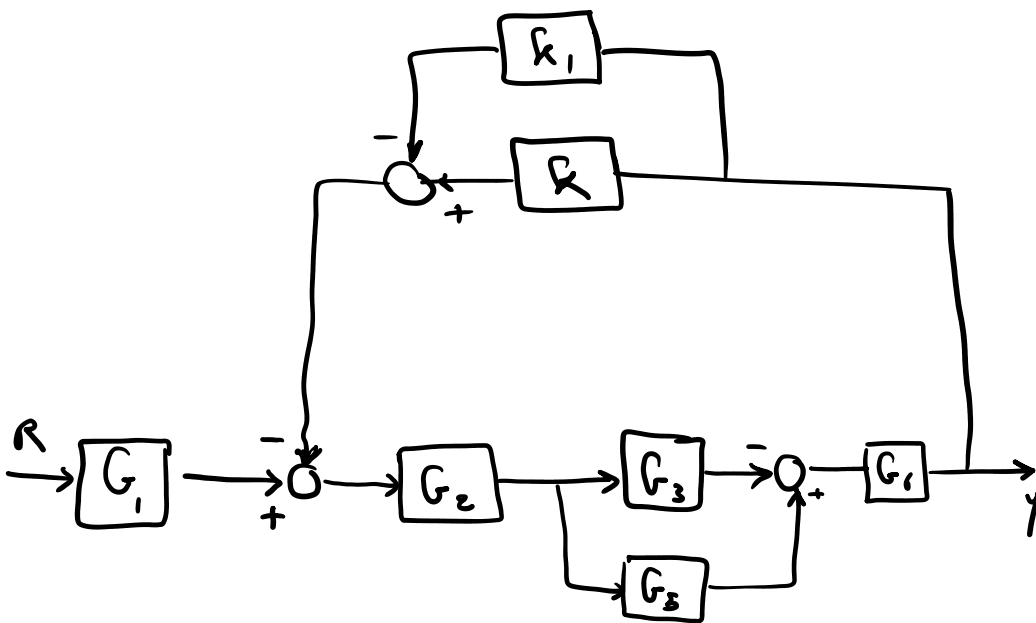
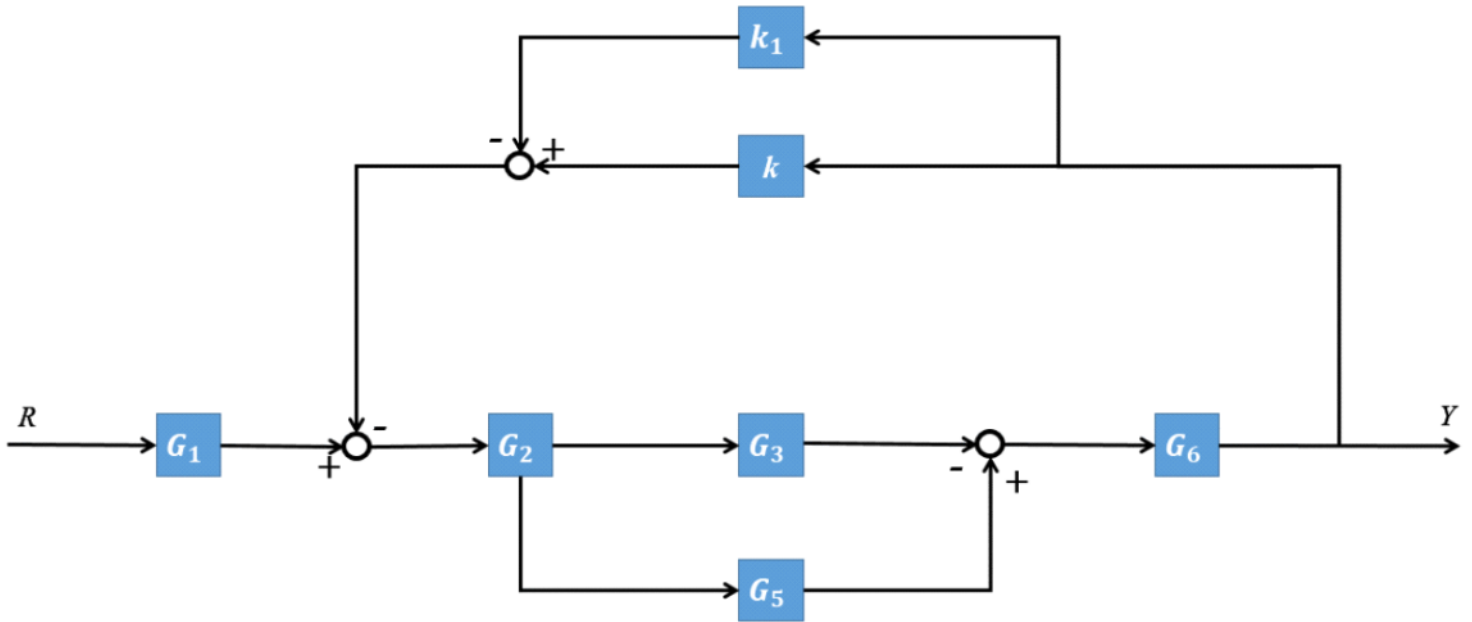
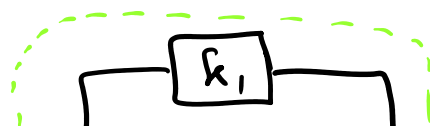
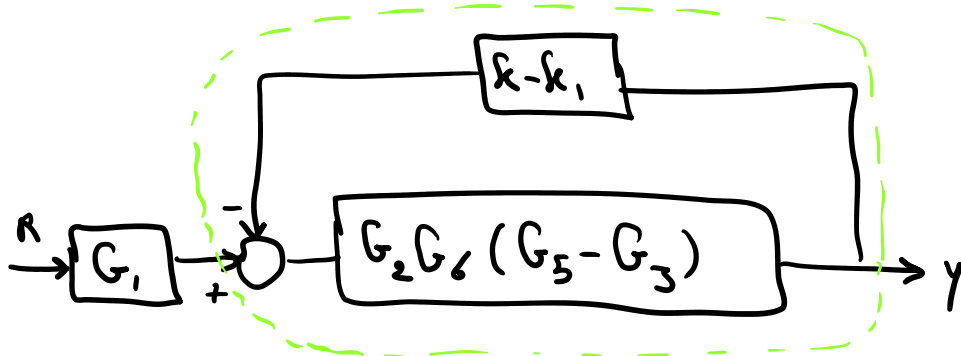
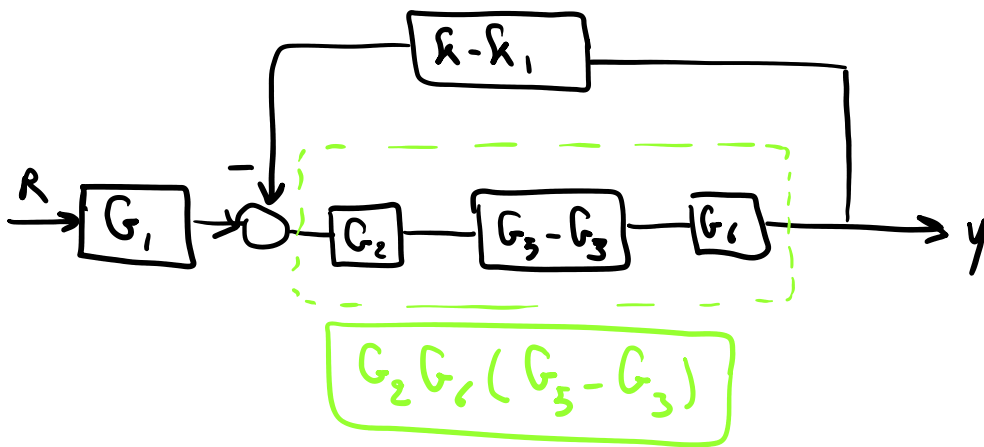
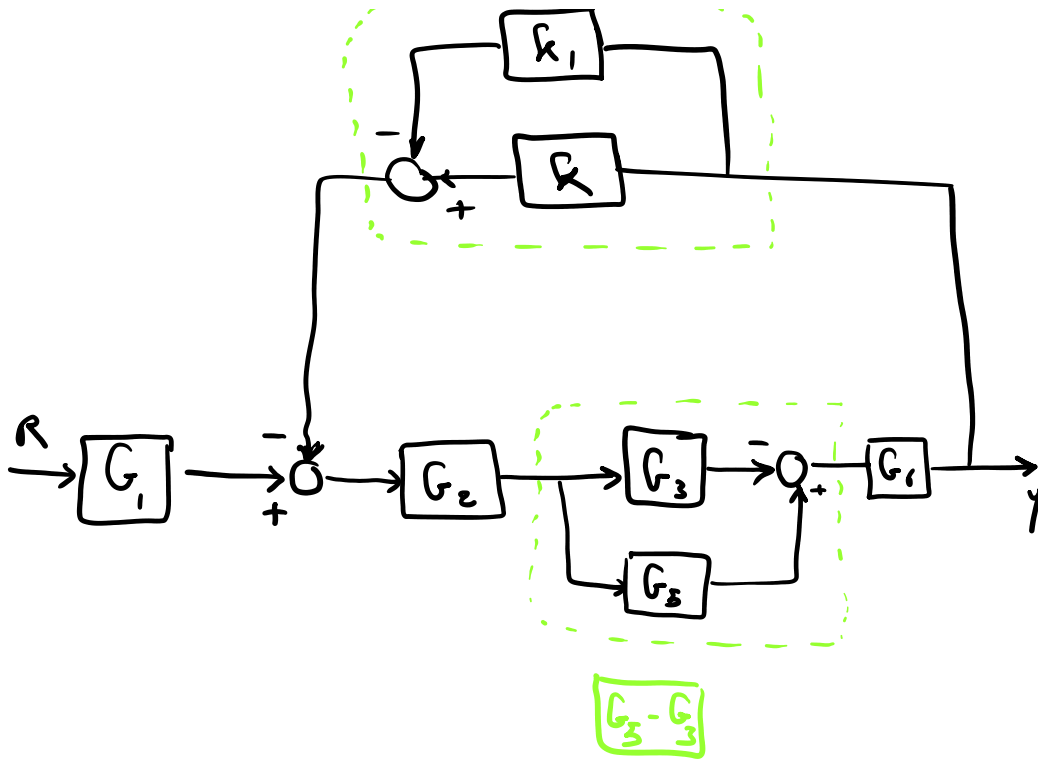


Find the transfer function of block diagram.

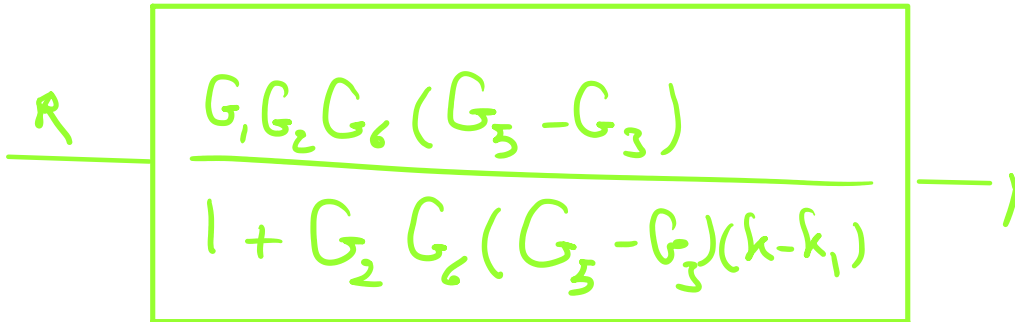
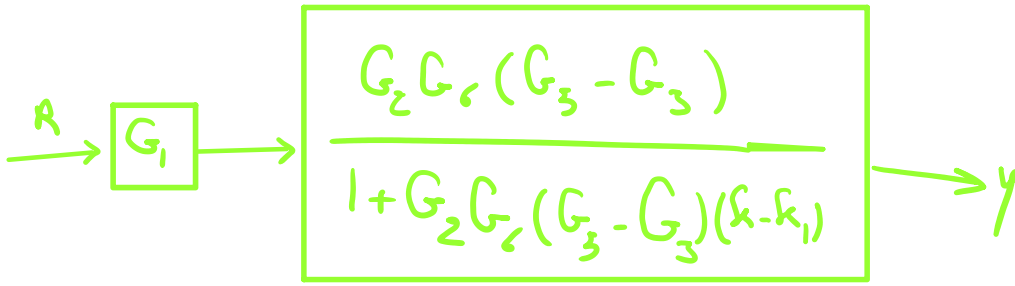


$k - k_1$



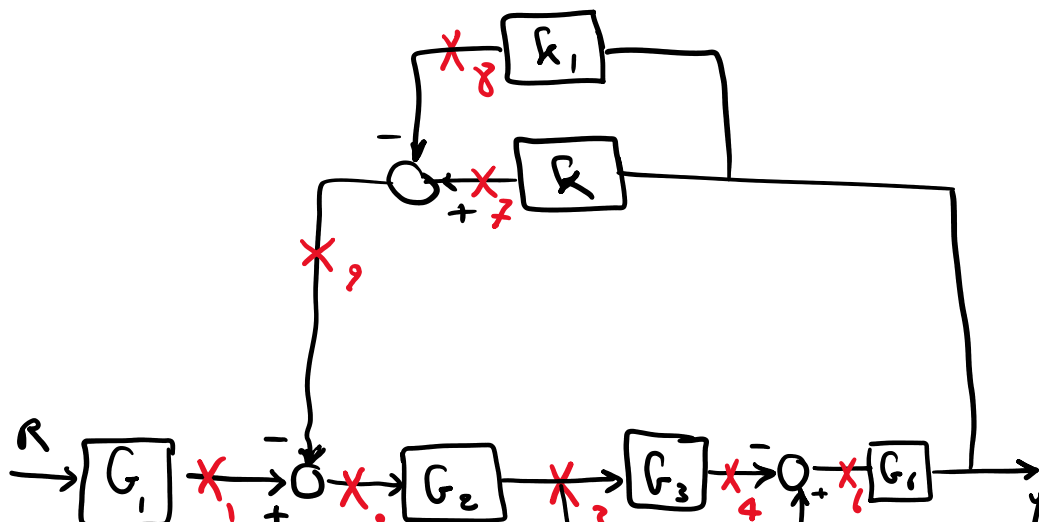


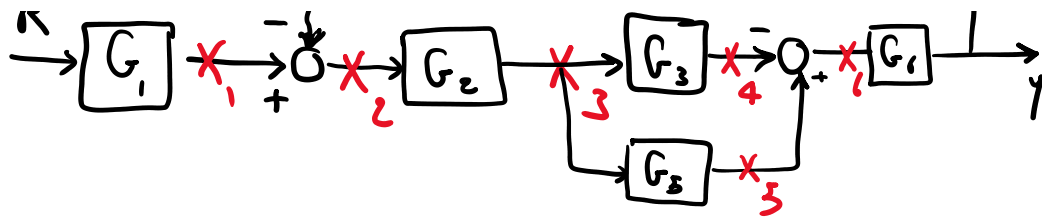
$$\frac{G_2 G_4 (G_3 - G_3)}{1 + G_2 G_4 (G_3 - G_3) (k - k_1)}$$



T.F. : $\frac{G_1 G_2 G_4 (G_3 - G_3)}{1 + G_2 G_4 (G_3 - G_3) (k - k_1)}$

روش اول





$$X_1 = G_1 R \quad (1)$$

$$X_2 = X_1 - X_9 \quad (2)$$

$$X_3 = G_2 X_2 \quad (3)$$

$$X_4 = G_3 X_3 \quad (4)$$

$$X_5 = G_3 X_3 \quad (5)$$

$$X_6 = X_5 - X_4 \quad (6)$$

$$X_7 = k_1 y \quad (7)$$

$$X_8 = k_1 y \quad (8)$$

$$X_9 = X_7 - X_8 \quad (9)$$

$$y = G_4 X_6 \quad (10)$$

$$(7), (8), (9) \Rightarrow X_9 = (k - k_1) y \quad (11)$$

$$(1), (2), (11) \Rightarrow X_2 = G_1 R - (k - k_1) y \quad (12)$$

$$(3), (12) \Rightarrow X_3 = G_1 G_2 R - G_2 (k - k_1) y \quad (13)$$

$$(4), (13) \Rightarrow X_4 = G_1 G_2 G_3 R - G_2 G_3 (k - k_1) y \quad (14)$$

$$(5), (13) \Rightarrow X_5 = G_1 G_2 G_3 R - G_2 G_3 (k - k_1) y \quad (15)$$

$$(6), (14), (15) \Rightarrow$$

$$X_6 = G_1 G_2 (G_5 - G_3) R - G_2 (G_5 - G_3) (k - k_1) y \quad (16)$$

$$(10), (16)$$

$$Y = G_1 G_2 G_4 (G_5 - G_3) R - \underbrace{G_2 G_4 (G_5 - G_3) (k - k_1)}_{\text{feedback}} Y \Rightarrow$$

$$[1 + G_2 G_4 (G_5 - G_3) (k - k_1)] Y = G_1 G_2 G_4 (G_5 - G_3) R$$

$$\text{T.F.} = \frac{Y}{R} = \frac{G_1 G_2 G_4 (G_5 - G_3)}{1 + G_2 G_4 (G_5 - G_3) (k - k_1)}$$