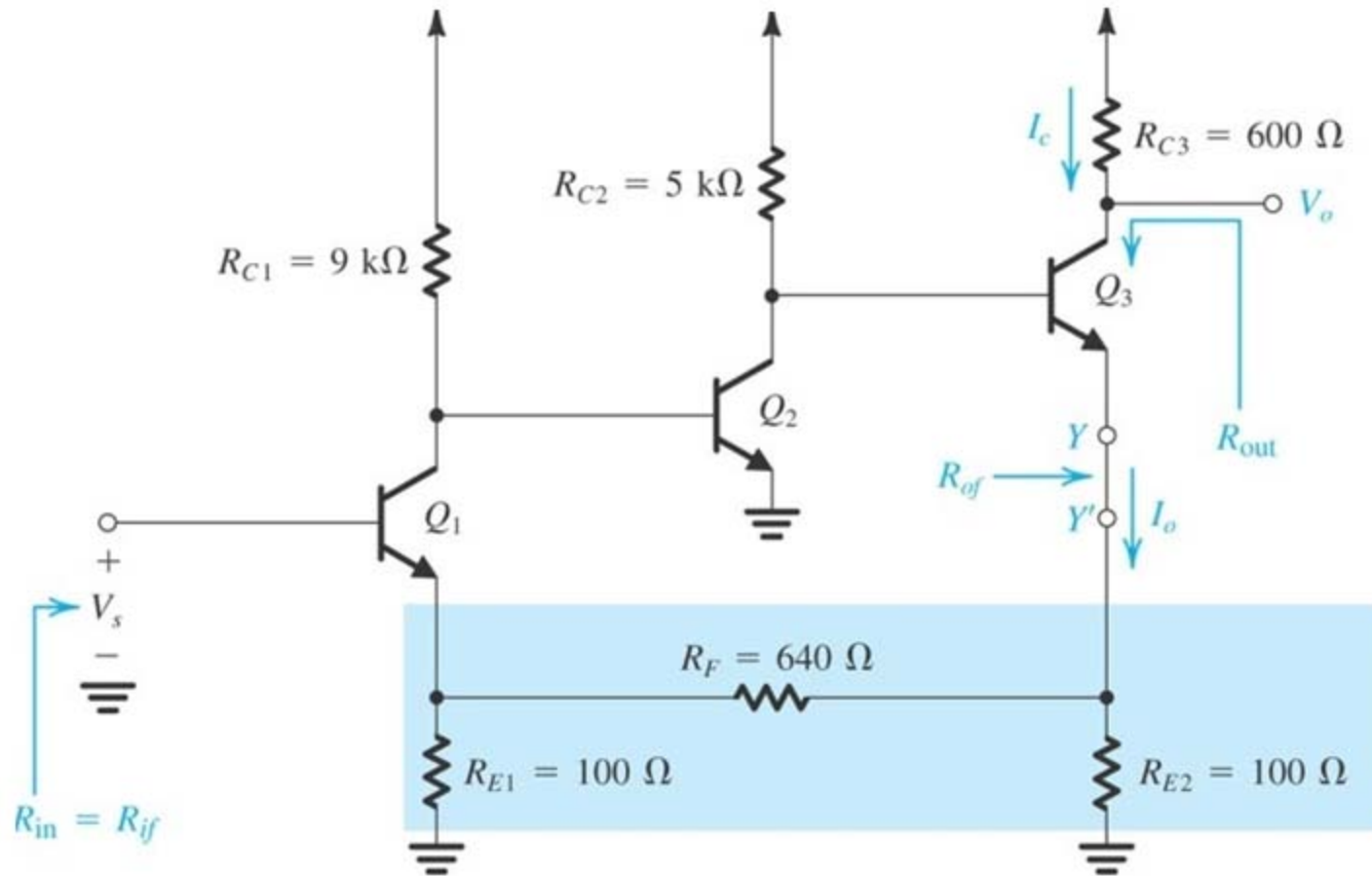


مثال 3 از فیڈبک جریان-ولتاژ



$$r_o = \infty$$

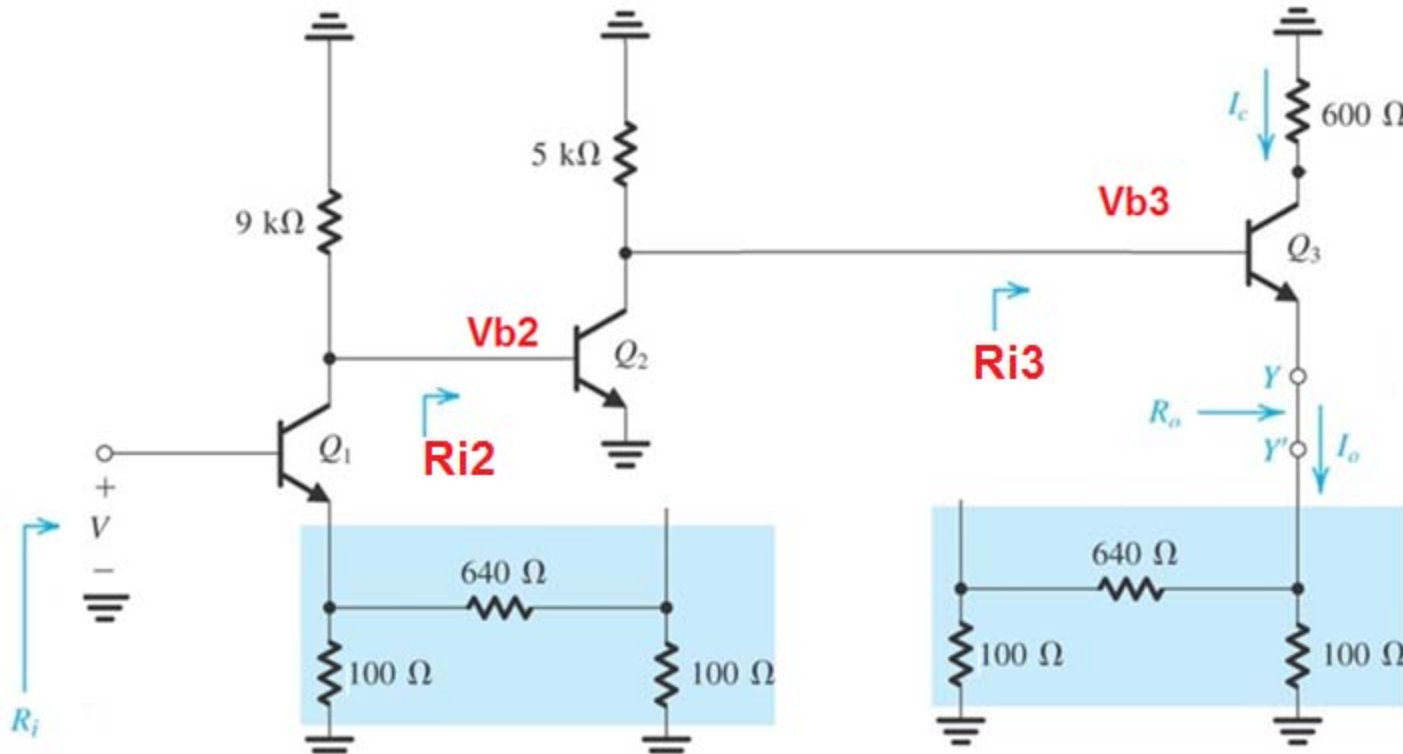
$$r_\pi = 2.5k$$

$$g_m = 40 \frac{mA}{V}$$

$$\frac{I_o}{V_s} = ? \quad \frac{V_o}{V_s} = ?$$

$$R_{in} = ? \quad R_{out} = ?$$

ادامه

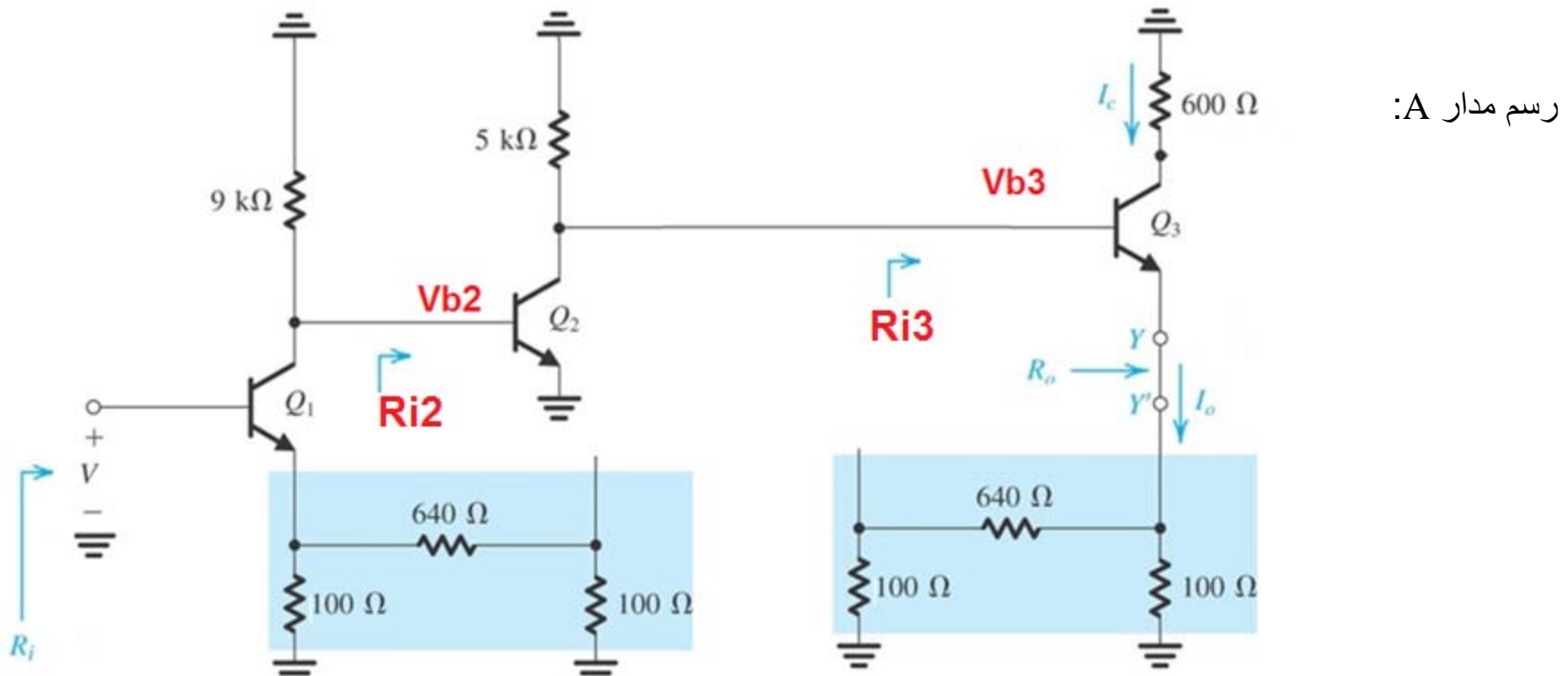


رسم مدار A:

$$\frac{I_o}{V_{b3}} = \frac{(1 + \beta)i_{b3}}{(r_{\pi3} + (1 + \beta)0.1 \parallel 0.74)i_{b3}} = 8.86 \frac{mA}{V} \quad \left| \quad \frac{V_{b3}}{V_{b2}} = -g_{m2}(5 \parallel R_{i3}) = -139 \right.$$

$$R_{i3} = r_{\pi3} + (1 + \beta)0.1 \parallel 0.74 = 11.4k \quad \left| \quad R_{i2} = r_{\pi2} = 2.5k \right.$$

ادامه



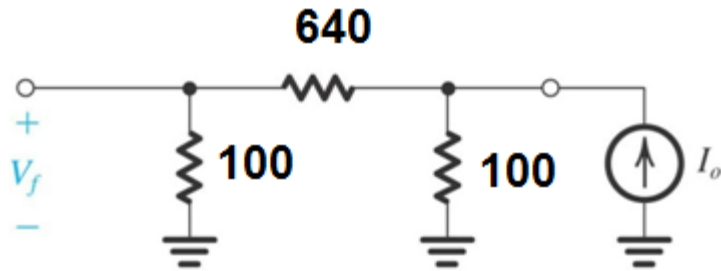
$$\frac{V_{b2}}{V} = - \frac{9 \parallel R_{i2}}{\frac{1}{g_{m1}} + 0.1 \parallel 0.74} = - \frac{1.95}{0.11} = -17 \Rightarrow A = \frac{I}{V} = 20936 \frac{mA}{V}$$

$$R_i = r_{\pi 1} + (1 + \beta) 0.1 \parallel 0.74 = 11.4k$$

$$R_o = 0.1 \parallel 0.74 + \frac{5 + r_{\pi 3}}{1 + \beta} = 0.16k$$

ادامه

محاسبه ضریب فیدبک:



$$K = \frac{V_f}{I_o} = \frac{0.1}{0.1 + (0.64 + 0.1)} \times 0.1k = 0.01k$$

$$(1 + KA) = 1 + 0.01 \times 20936 = 210$$

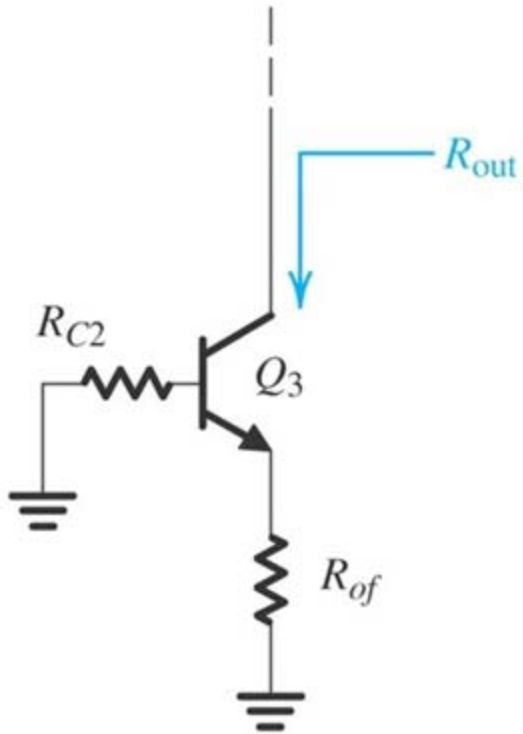
$$A_f = \frac{I_o}{V_s} = \frac{A}{1 + KA} = \frac{20936}{210} = 99.6 \frac{mA}{V}$$

$$\frac{V_o}{V_s} = \frac{-I_o \times 0.6k}{V_s} = -0.6k \times A_f = -59.7$$

$$R_{of} = R_o (1 + KA) = 33.6k$$

$$R_{in} = R_{if} = R_i (1 + KA) = 2394k$$

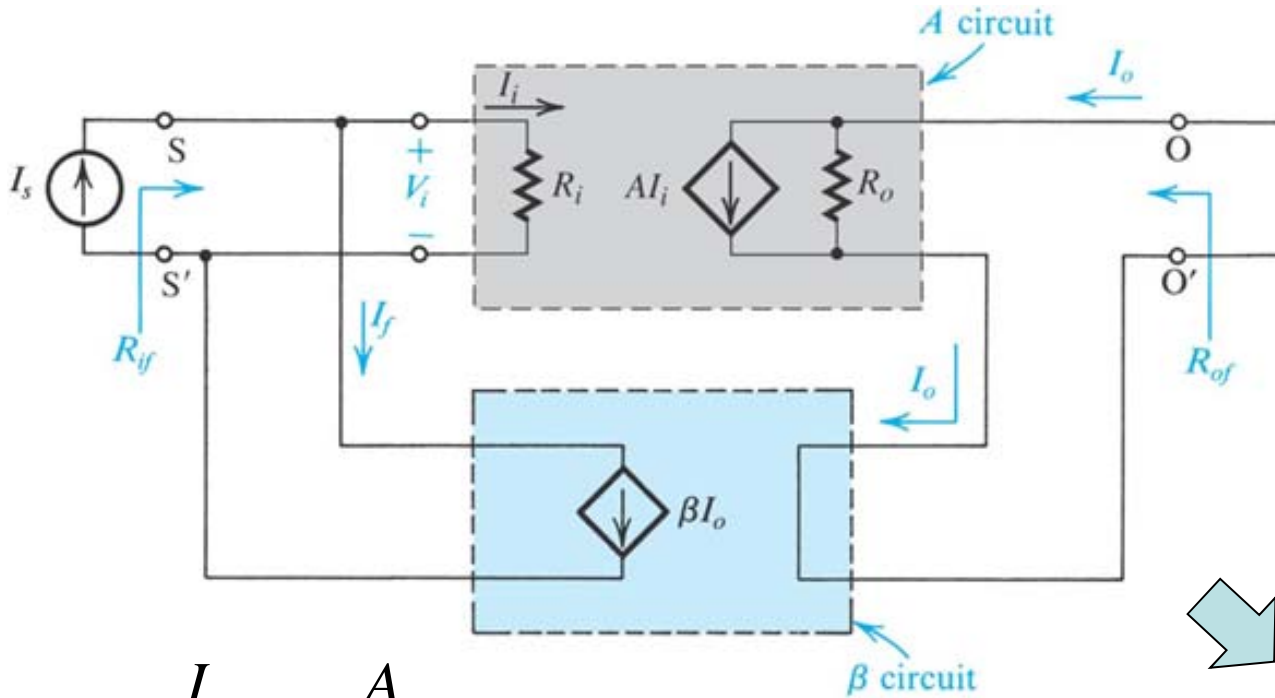
ادامه



$$R_{of} = R_o (1 + KA) = 33.6k$$

$$R_{out} = \infty$$

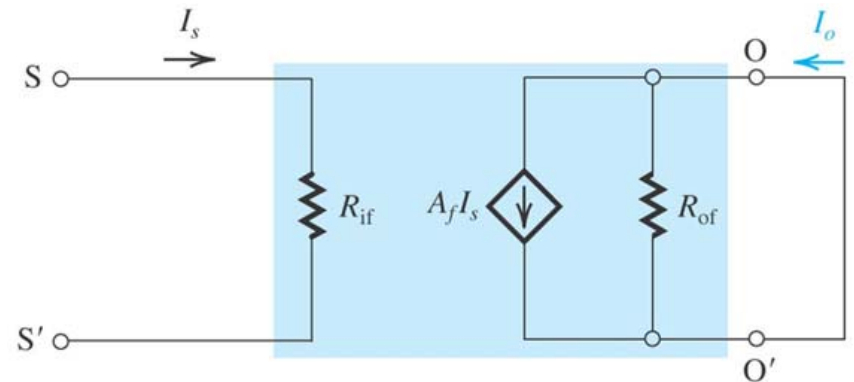
فیدبک جریان-جریان



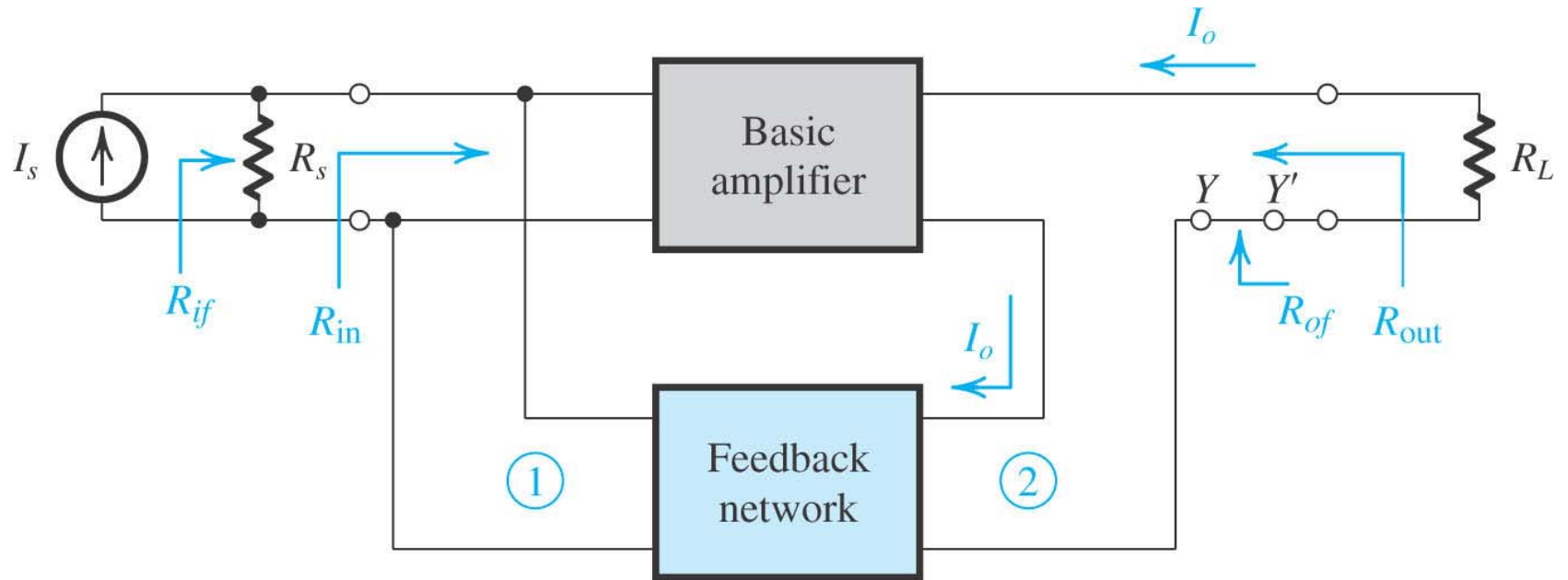
مدار معادل

$$A_f = \frac{I_o}{I_s} = \frac{A}{1 + \beta A}$$

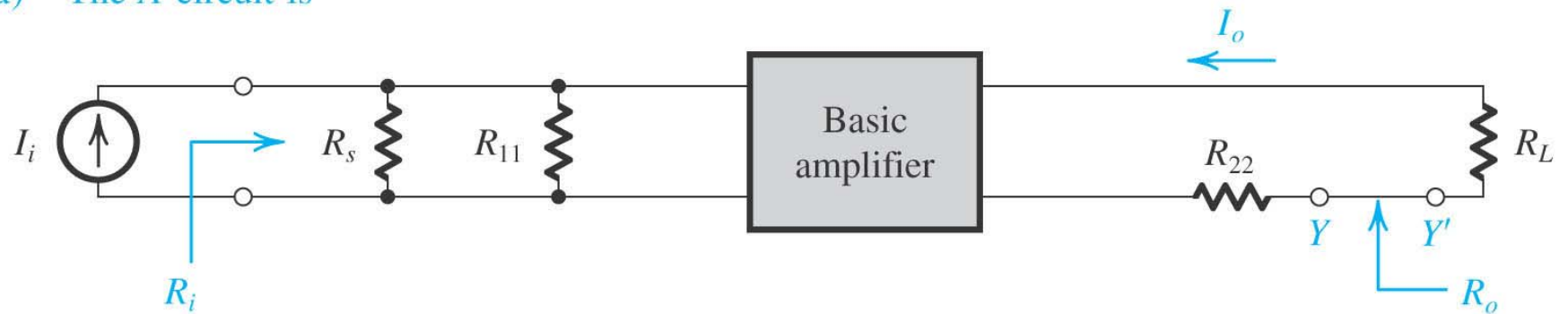
$$R_{if} = \frac{R_{in}}{1 + \beta A} \quad R_{of} = R_o (1 + \beta A)$$



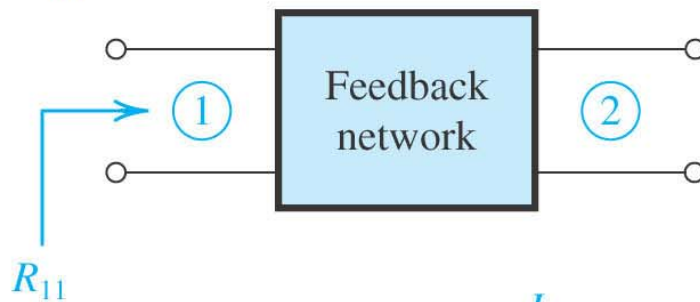
فیدبک غیرایده آل



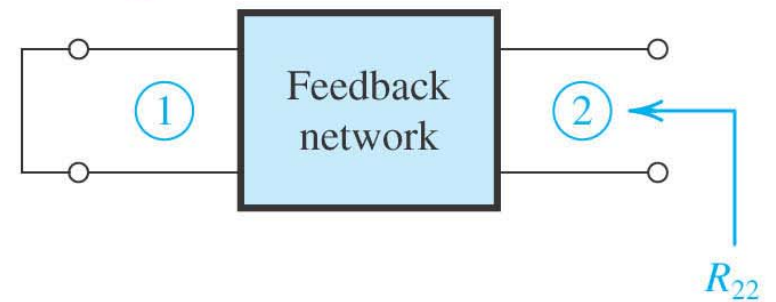
(a) The A circuit is



where R_{11} is obtained from

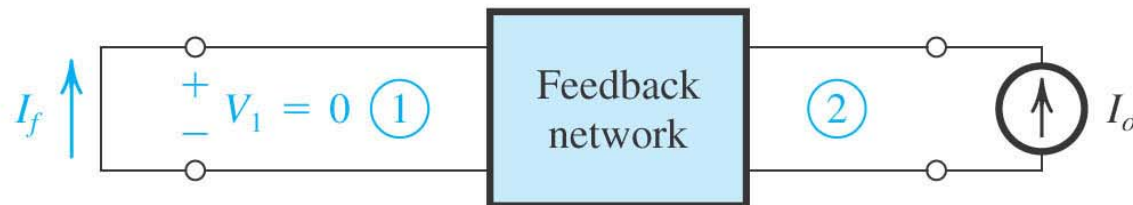


and R_{22} is obtained from



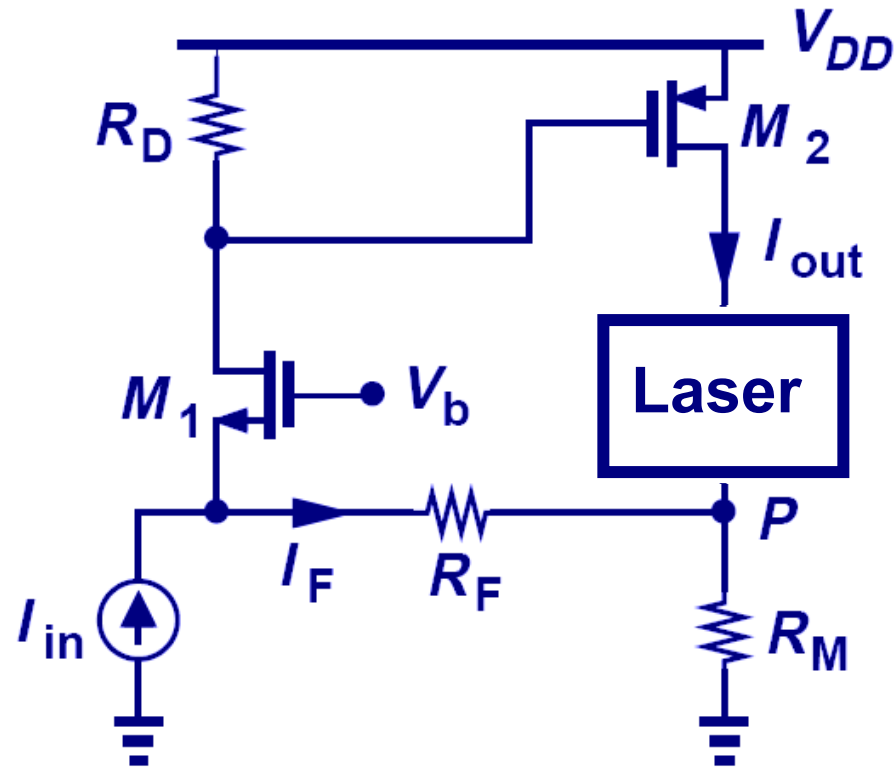
and the gain A is defined as $A \equiv \frac{I_o}{I_i}$

(b) β is obtained from



$$\beta \equiv \left. \frac{I_f}{I_o} \right|_{V_1 = 0}$$

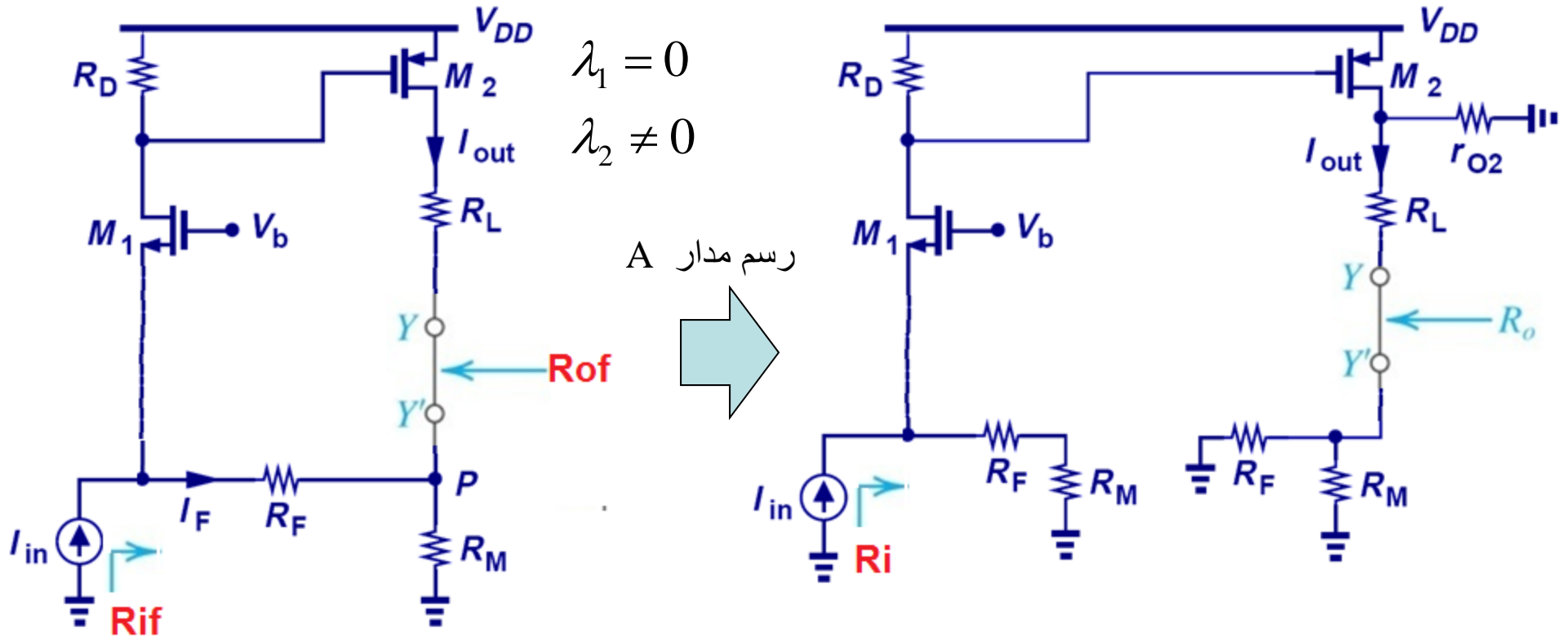
تشخیص پلاریته فیڈبک



$I_{in} \uparrow \rightarrow V_{D1} \uparrow, I_{out} \downarrow \rightarrow V_P \downarrow, I_F \uparrow \rightarrow V_{D1} \downarrow, I_{out} \uparrow$

Negative Feedback

مثال از فی‌دبک جریان-جریان

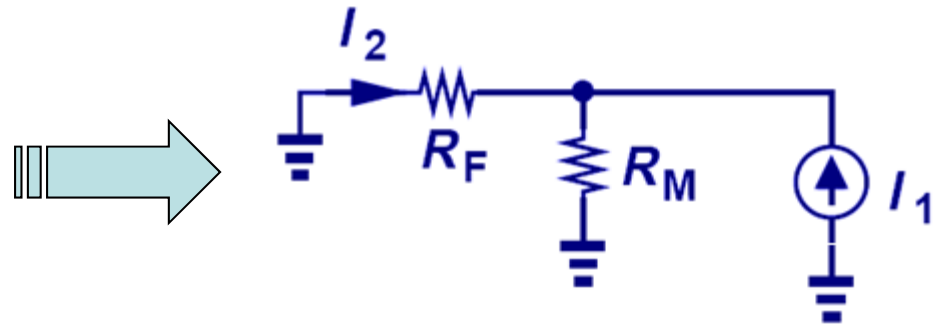
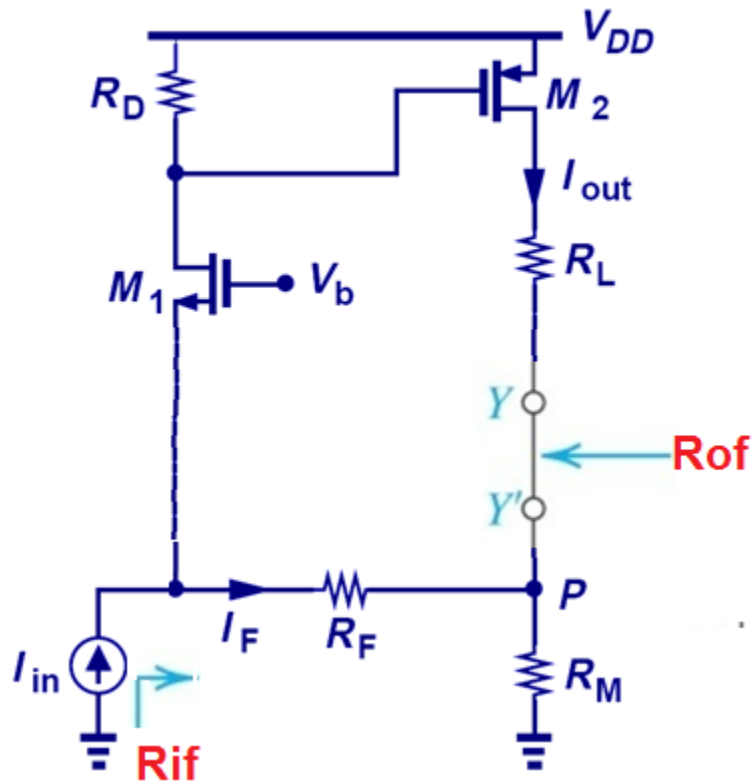


$$A = \frac{I_o}{I_{in}} = \frac{(R_F + R_M)R_D}{R_F + R_M + \frac{1}{g_{m1}}} \cdot \frac{-g_{m2}r_{O2}}{r_{O2} + R_L + R_M \parallel R_F}$$

$$R_i = \frac{1}{g_{m1}} \parallel (R_F + R_M)$$

$$R_o = r_{O2} + R_F \parallel R_M + R_L$$

ادامه



$$\beta = -R_M / (R_F + R_M)$$

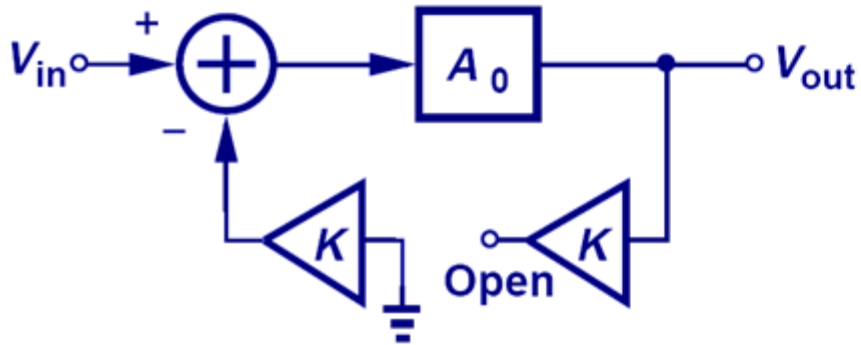
$$A_f = \frac{I_{out}}{I_{in}} = A / (1 + \beta A)$$

$$R_{if} = R_i / (1 + \beta A)$$

$$R_{of} = R_o (1 + \beta A)$$

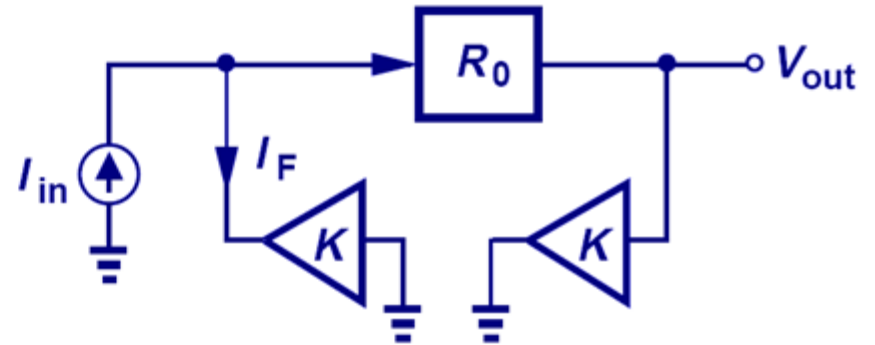
جمع بندی رسم مدار A در توپولوژی های مختلف فییدبک

فییدبک ولتاژ-ولتاژ

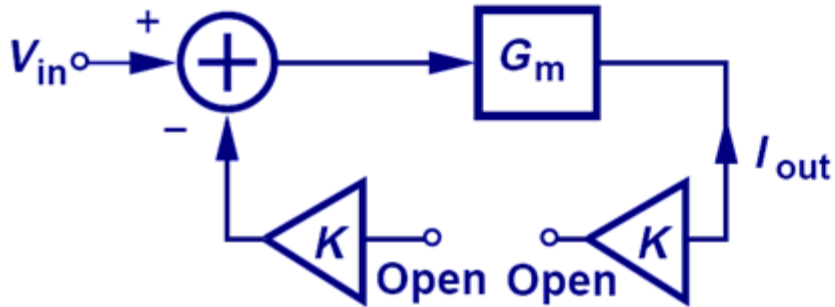


(a)

فییدبک ولتاژ-جریان

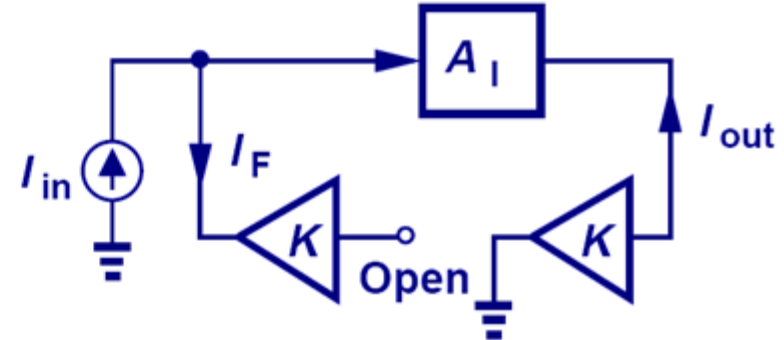


(b)



(c)

فییدبک جریان-ولتاژ

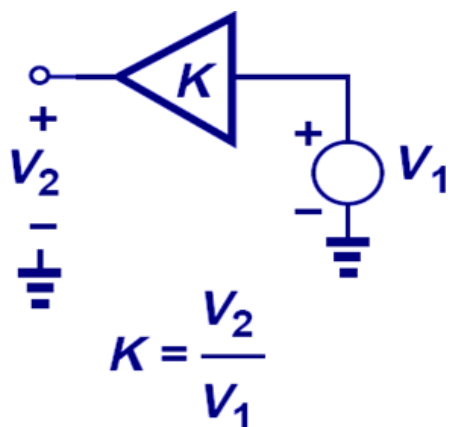


(d)

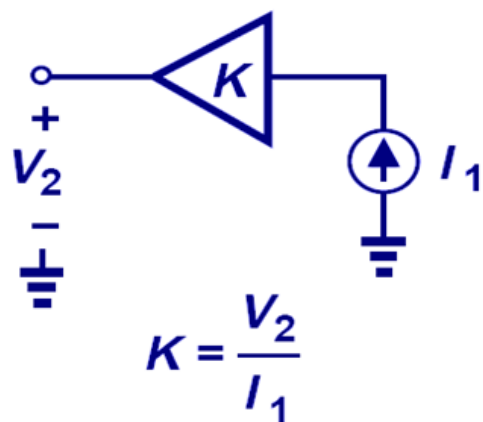
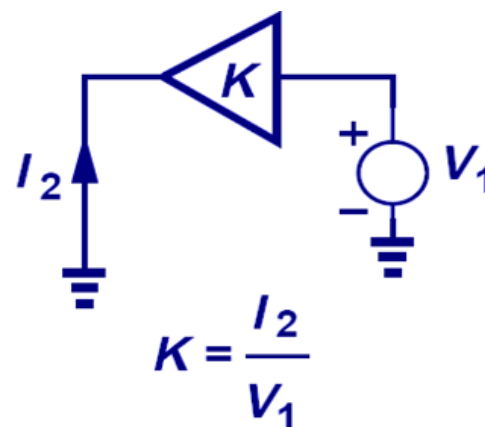
فییدبک جریان-جریان

جمع بندی محاسبه ضریب فیدبک در توپولوژی های مختلف

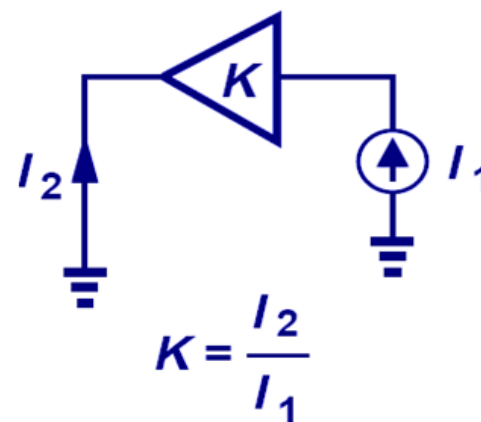
فیدبک ولتاژ-ولتاژ



فیدبک ولتاژ-جریان



فیدبک جریان-ولتاژ



فیدبک جریان-جریان