

Control Systems

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1 Feedback Circuits 1

Abstract—This manual is an introduction to control systems based on GATE problems. Links to sample Python codes are available in the text.

Download python codes using

svn co <https://github.com/gadepall/school/trunk/control/codes>

Parameter	Value
input resistance	∞
output resistance	0
Input voltage	V_s
Output Voltage	V_o
Feeding resistance	R_1
Feedback resistance	R_2
Open Loop Gain, G	10^4 V/V
Closed Loop Gain, T	100 V/V

TABLE 1.1

1 FEEDBACK CIRCUITS

1.1. For the feedback voltage amplifier fig.1.1 and specs in Table 1.1. If $R_1 = 1\text{k}\Omega$, find the value of R_2 that results in a closed loop gain of 100 V/V.

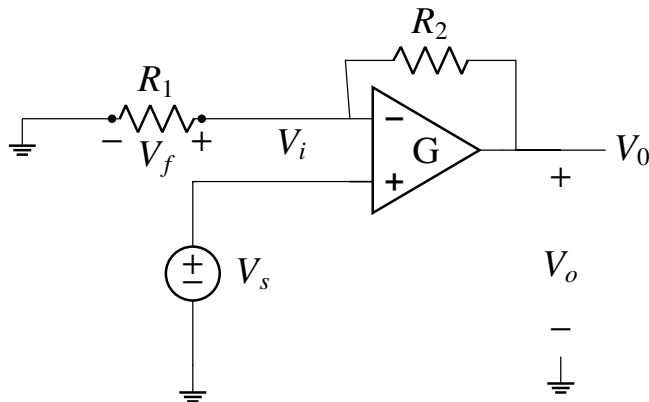


Fig. 1.1

Solution: The small signal equivalent fig. 1.1

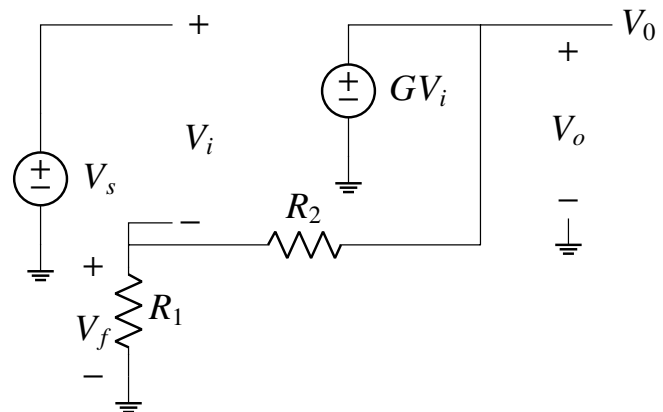


Fig. 1.1

Using ??

$$\Rightarrow H = \frac{R_1}{R_1 + R_2} \quad (1.1.1)$$

$$T = \frac{G}{1 + HG} \quad (1.1.2)$$

$$\Rightarrow H = \frac{1}{T} - \frac{1}{G} \quad (1.1.3)$$

$$= \frac{1}{100} - \frac{1}{10^4} \quad (1.1.4)$$

$$\Rightarrow H = 0.0099 \quad (1.1.5)$$

Putting H in (1.1.1) gives

$$\Rightarrow R_2 = 100.01 \text{ k}\Omega$$

1.2. What does the gain become if R_1 is removed?

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Solution: H goes to 0. By, 1.1.3

$$T = G \quad (1.2.1)$$