Control Systems

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Contents

***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
```

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.

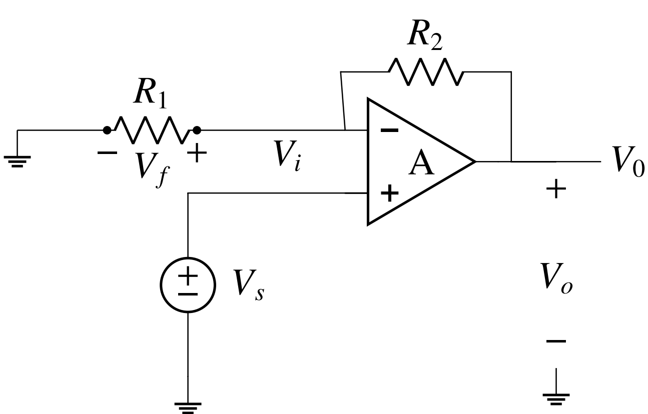

Fig. 1.1

Solution: The small signal equivalent fig. 1.1

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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, A	10^4V/V
Closed Loop Gain, A_f	**100 V/V**

TABLE 1.1

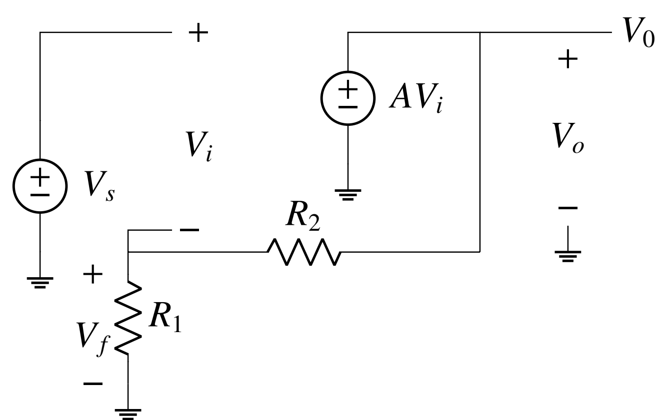

Fig. 1.1

$$V_f = \beta V_o \tag{1.1.1}$$

$$= \frac{R_1}{R_1 + R_2}.V_o \tag{1.1.2}$$

$$\implies \beta = \frac{R_1}{R_1 + R_2} \tag{1.1.3}$$

$$A_f = \frac{A}{1 + \beta A} \tag{1.1.4}$$

$$\implies \beta = \frac{1}{A_f} - \frac{1}{A} \tag{1.1.5}$$

$$= \frac{1}{100} - \frac{1}{10^4} \tag{1.1.6}$$

$$\implies \beta = 0.0099 \tag{1.1.7}$$

Putting β in (1.1.3) gives
$\implies R_2 = 100.01$ kΩ

1.2. What does the gain become if R_1 is removed?
Solution: β goes to 0. So,

$$A_f = A \tag{1.2.1}$$