Control Systems

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Contents

***Abstract*—This manual is an introduction to control systems in feedback circuits. Links to sample Python codes are available in the text.**

Download python codes using

```
svn co https://github.com/gadepall/school/trunk/
    control/feedback/codes
```

1 Feedback Voltage Amplifier: Series-Shunt

1.0.1. A series-shunt feedback amplifier employs a basic amplifier with input and output resistances each of $2K\Omega$ and gain G = 1000V/V. The feedback factor H = 0.1V/V. Find the input resistance R_{if}, output resistance R_{of} and gain of the closed-loop amplifier.

Parameters	Definition	For given circuit
Open loop gain	G	1000
Feedback factor	H	0.1
Open-loop input resistance	R_i	$2K\Omega$
Open-loop output resistance	R_o	$2K\Omega$

TABLE 1.0.1

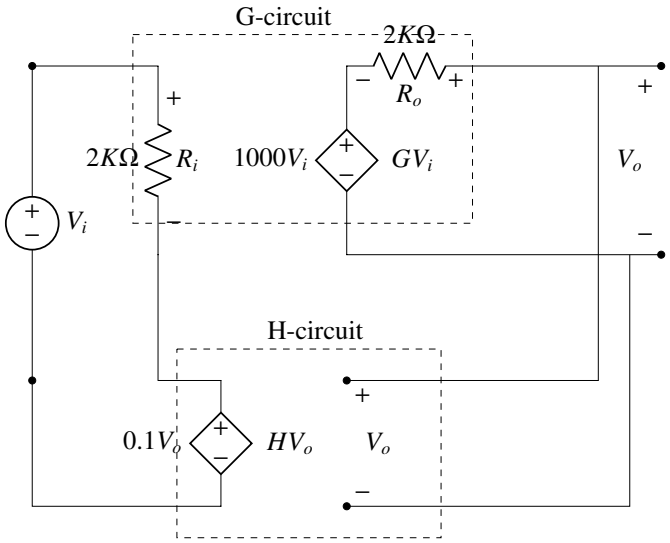

Fig. 1.0.1.1: Ideal structure

Solution: For given data, see Table:1.0.1. For feedback-amplifier circuit and equivalent circuit, see fig:1.0.1.1 and 1.0.1.2
Closed-loop gain,

$$T = \frac{G}{1+GH} = 9.9 \tag{1.0.1.1}$$

Input resistance,

$$R_{if} = (1+GH)\,R_i = 202K\Omega \tag{1.0.1.2}$$

Output resistance,

$$R_{of} = \frac{R_o}{1+GH} = 19.802\Omega \tag{1.0.1.3}$$

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2 Feedback Current Amplifier: Shunt-Series

2.1 Ideal Case

2.2 Practical Case

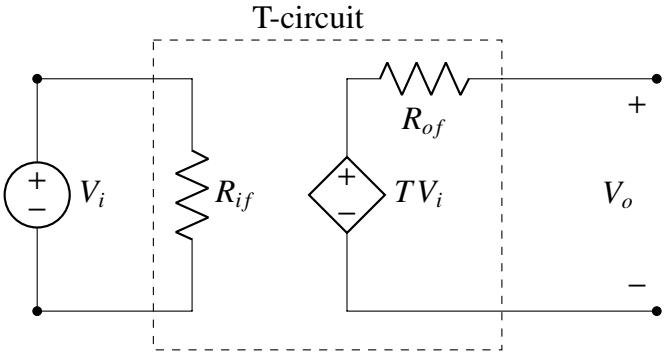

Fig. 1.0.1.2: Equivalent circuit