

Series-shunt feedback amplifier

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A series-shunt feedback amplifier employs a basic amplifier with parameters listed in Table 0. Find the

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 0

input resistance R_{if} , output resistance R_{of} and gain of the closed-loop amplifier.

1. Represent the parameters in Table 0 through a circuit.

Solution: See Fig. 1.1.

2. Design the H circuit.

Solution: From fig:2.1

$$H = \frac{V_f}{V_o} = \frac{R_1}{R_1 + R_2} = 0.1 \quad (2.1)$$

where R_1 and R_2 are listed in Table 2.

3. Find the closed loop gain T and design the equivalent circuit.

Solution: See Fig. 3.1 for the equivalent circuit for T .

$$T = \frac{G}{1 + GH} \quad (3.1)$$

$$= 9.9 \quad (3.2)$$

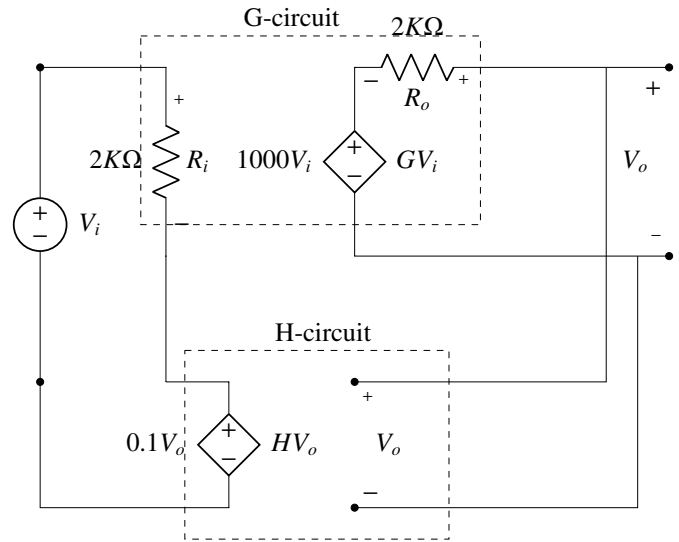


Fig. 1.1: Ideal structure

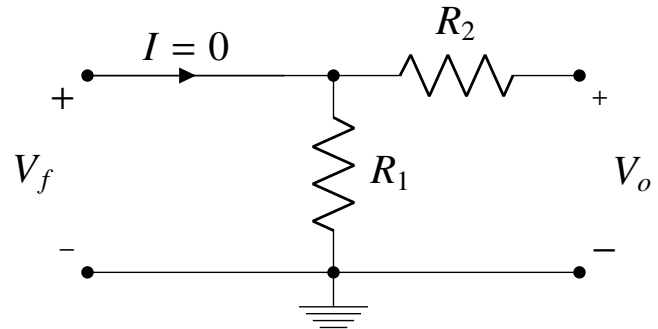


Fig. 2.1: H circuit

4. Show R_{if} and R_{of} for the closed loop circuit and compute them.

Solution: See Fig. 4.1.

$$R_{if} = (1 + GH) R_i = 202K\Omega \quad (4.1)$$

$$R_{of} = \frac{R_o}{1 + GH} = 19.802\Omega \quad (4.2)$$

5. Verify the amplifier gain for a sinusoidal input of 1kHz through spice.

Solution: See Fig. 5.1 generated using

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Parameter	Value
Op-amp gain(μ)	10^4
R_s	100Ω
R_{id}	$1K\Omega$
r_o	$10K\Omega$
R_1	$1K\Omega$
R_2	$9K\Omega$
R_L	$3.33K\Omega$

TABLE 2: Parameter values

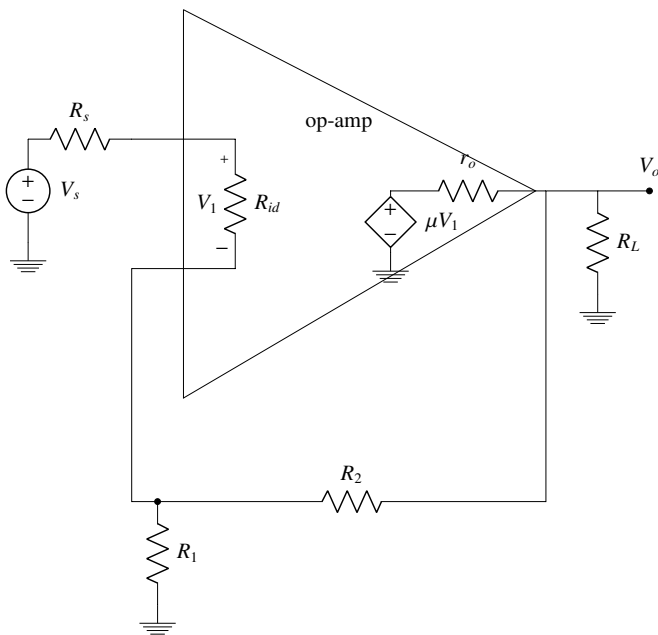


Fig. 3.1: Amplifier design

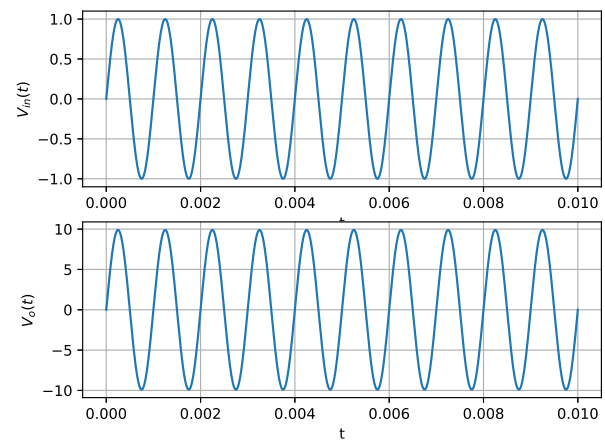


Fig. 5.1: Time domain output of the simulation

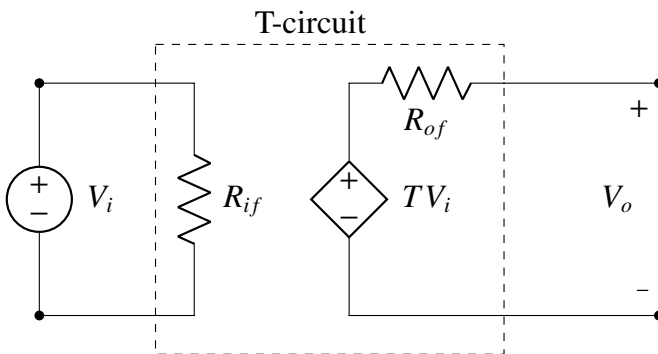


Fig. 4.1: Equivalent circuit

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/codes/ee18btech11039/
ee18btech11039_spice1.py
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