Negative feedback

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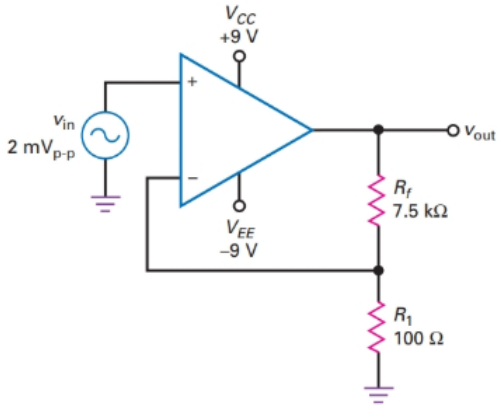
1 In Fig. 17-16, the op amp has an Rin of 3 MV and an RCM of 500 MV. What is the closed-loop input impedance? Use an AVOL of 200,000 for the op amp.

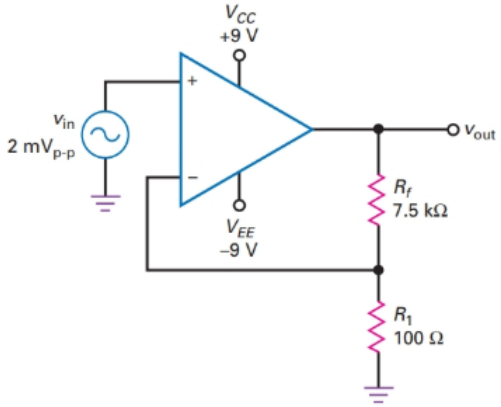


The open loop input resistance R_{in} = 3MΩ
The common mode input resistance R_{CM} = 500MΩ
The open loop voltage gain = A_{vol} = 200,000

B = V_2 / V_{out} = R1/(R1+Rf) = 100Ω/(100Ω + 7.5kΩ) = 0.013
The feedback factor is 0.013

Zin = (1+ AvolB)*RIN|| RCM = [(1+(200000)(0.013)) (3MΩ)]|| 500MΩ = 470MΩ.

2 What is the closed-loop output impedance in Fig. 17-16? Use an AVOL of 75,000 and an Rout of 50 V.



The open loop output resistance R_{out} = 50Ω
The open loop voltage gain = Avol = 75,000

B = V_2 / V_{out} = R1/(R1+Rf) = 100Ω/(100Ω + 7.5kΩ) = 0.013
The feedback factor is 0.013

Z_{out} = R_{out}/(1+ A_{vol}*B) = 50Ω / (1 + (75000) 0.13) = 0.051Ω

3 A VCVS amplifier uses an LM324 with (1 +AVOL*B) = 1000 and f2(OL) = 2 Hz. What is the closed-loop bandwidth?

f_{2OL} = 2hz
(1+A_{vol}*B) = 1000

The closed loop bandwidth of VCVS amplifier is

f_{2CL} = f_{2OL}*(1+A_{vol}*B) = (2hz) (1000) = 2khZ

4 An ICVS amplifier uses an LM318 with AVOL = 20,000 and f2(OL) = 750 Hz. What is the closed-loop bandwidth

It is given that f_{2OL} = 750 Hz
Open loop voltage gain A_{VOL} = 20000

The closed loop bandwidth of ICVS(current controlled voltage source) amplifier is

f_{2CL} = f_{2OL}*(1+A_{vol}) = (1+20000) 750Hz = 15MHz

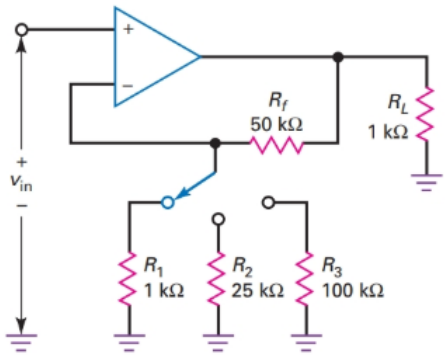
5 An ICIS amplifier uses a TL072 with f2(OL) = 120 Hz. If (1 + A_{VOL}B) = 5000, what is the closed-loop bandwidth?

f_{2OL} = 120hz
(1+A_{vol}*B) = 5000

The closed loop bandwidth of ICIS(current controlled current source) amplifier is

f_{2CL} = f_{2OL}*(1+A_{vol}*B) = (120Hz) (5000) = 600kHZ

6 In Fig. 17-22, what is the output voltage for each position of the switch if the input voltage is 10 mV?



Non inverting amplifier

A = 1 + Rf/R

A_1 = 1 + 50kΩ/1kΩ = 51
V_{out1} = V_{in}*A1 = 10mV * 51 = 510mV
A_2 = 1 + 50kΩ/25kΩ = 3
V_{out2} = V_{in}*A2 = 10mV * 3 = 30mV
A_3 = 1 + 50kΩ/100kΩ = 1.5
V_{out3} = V_{in}*A3 = 10mV * 1.5 = 15mV