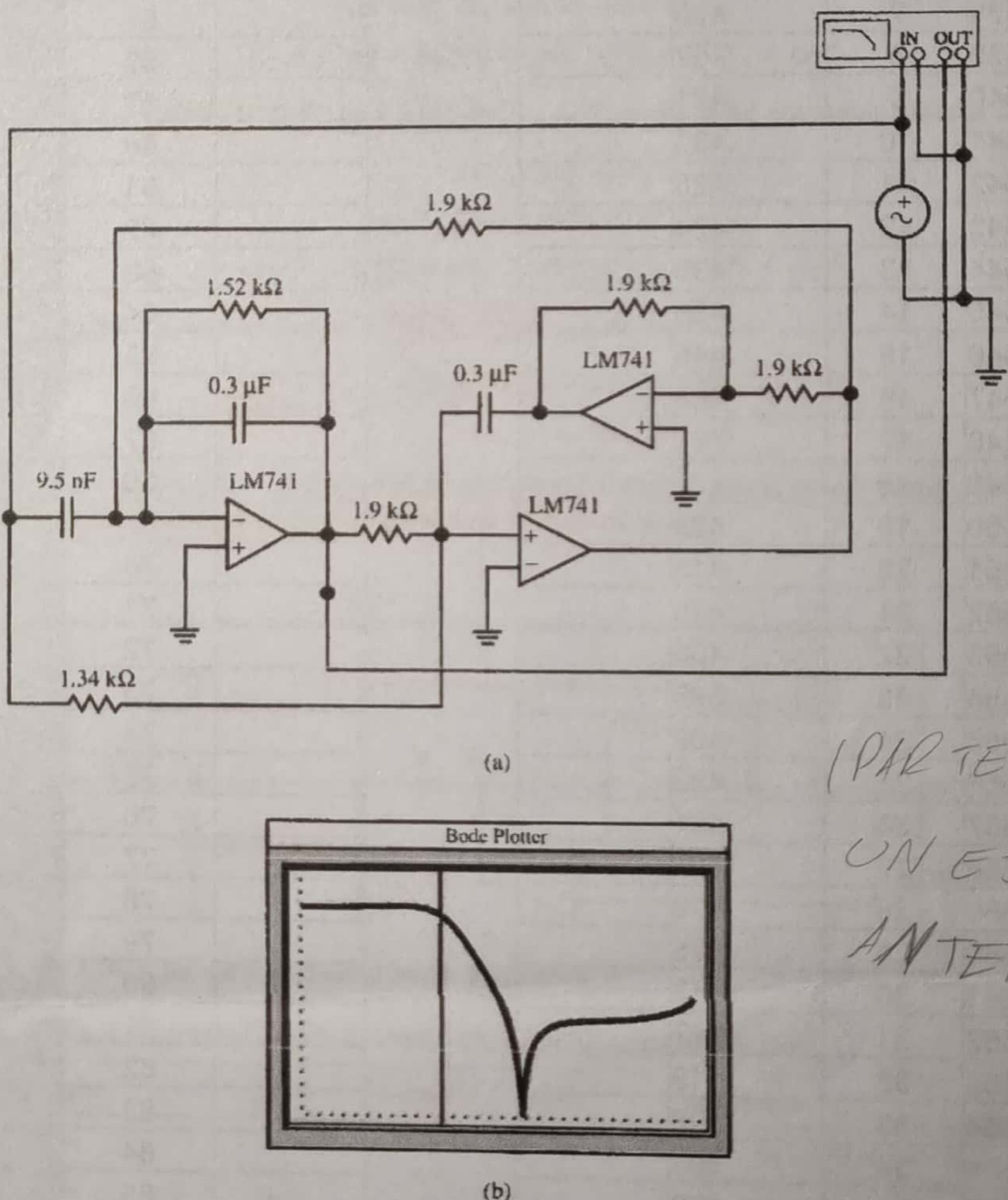
La variante en este circuito es que, todos los componentes que originalmente estaban conectados directamente a masa (utilizados), ahora los hemos "levantados" y tienen parte conectada a la entrada V_1 a través de una nueva admitancia. Se realizó una predimensión con V_1, junto con un levantamiento para el de → esas admitancias que estaban a masa.

clave

$R = 1.9\ \text{k}\Omega$ and $QR_2 = 1.52\ \text{k}\Omega$. The lowpass notch circuit and its performance are shown in Fig. 5.15. The transmission zero is at 1.9 kHz ($= f_0\sqrt{c/a}$) as expected.

The design is seen to be easy; no careful matching of resistors is required and one opamp is saved compared to the circuit in Example 5.5. We notice a rise in gain at higher frequencies (beyond 30 kHz) caused by the nonideal opamps. This peaking was avoided in Example 5.5 because the lowpass behavior of the summer suppressed it.

Utilizado para la TS5



(PARTE DE UN EJEMPLO ANTERIOR)

Figure 5.15 The lowpass notch filter of Example 5.7 and test results. (Bode Plotter scales: 10 Hz to 100 kHz; −60 to +10 dB; cursor at 292 kHz, 0.45 dB.)

Let us consider next whether a general biquad can be constructed from the GIC circuit in Fig. 4.41. The circuit is repeated in Fig. 5.16 with all available grounded components split into a part connected to the input and a part remaining at ground. We also have labeled all

Revisar sección del capítulo anterior para encontrar sus expresiones de diseño. (Págs 193-199 del PDF)

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capacitors as C and all resistors, with the exception of the one determining the quality factor, as R because we found earlier that this was the optimum choice. To analyze the circuit, we write Kirchhoff's current law at the nodes labeled V_5, V_4, and V_6 and assume ideal opamps so that $V_4 = V_5 = V_6$. We obtain

$$2GV_6 = cGV_1 + GV_2$$
$$(G + sC)V_4 = GV_2 + sCV_3$$
$$(G + G/Q + sC)V_5 = (bG/Q + asC)V_1 + GV_3$$

Calling again $\omega_0 = 1/(CR)$, and using that $V_4 = V_5 = V_6$, these equations become

$$2V_4 = cV_1 + V_2 \tag{5.33}$$
$$(\omega_0 + s)\, V_4 = \omega_0 V_2 + s V_3 \tag{5.34}$$
$$[\omega_0(1 + 1/Q) + s]V_4 = (b\omega_0/Q + as)\, V_1 + \omega_0 V_3 \tag{5.35}$$

Solving for the transfer function $T(s) = V_2/V_1$ results in

$$T(s) = \frac{V_2}{V_1} = \frac{s^2(2a - c) + s\,(\omega_0/Q)\,(2b - c) + c\omega_0^2}{s^2 + s\omega_0/Q + \omega_0^2} \tag{5.36}$$

We observe that Eq. (5.36) can realize an arbitrary transfer function with zeros anywhere in the s-plane. Table 5.4 shows the parameter values necessary.

Al igual que con el Ackerberg-Mossberg, se obtiene la función bicuadrática completa, capaz tmb de implementar ceros en cualquier parte del plano s.

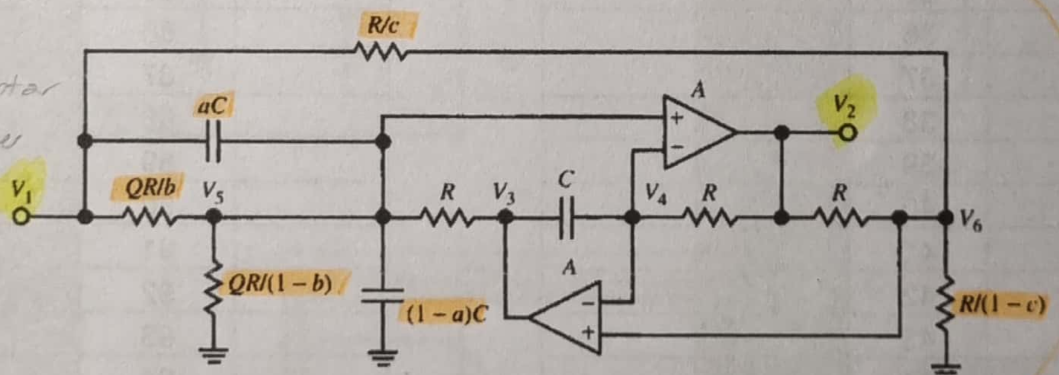

Figure 5.16 A general biquad based on the GIC circuit.

TABLE 5.4 Parameter Choice to Define the Filter Type for Eq. (5.36)[a]

Filter type	a	b	c	Comments
Highpass	a	0	0	$2a$ sets the high-frequency gain
Lowpass	$c/2$	$c/2$	c	c sets the low-frequency gain
Bandpass	0	b	0	$2b$ sets the bandpass gain
Allpass	1	0	1	
Notch	1	1/2	1	
Highpass notch	$a > c$	$c/2$	c	c sets the low-frequency gain; $(2a - c)$ sets the high-frequency gain
Lowpass notch	$a < c$	$c/2$	c	c sets the low-frequency gain; $(2a - c)$ sets the high-frequency gain

[a] In all cases $R = 1/(\omega_0 C)$.