10–55 s-Domain OP AMP Circuit Analysis

The OP AMP circuit in Figure P10–55 is in the zero state. Transform the circuit into the s domain and use the OP AMP circuit analysis techniques developed in Sect. 4–4 to find the relationship between the input $V_1(s)$ and the output $V_2(s)$.

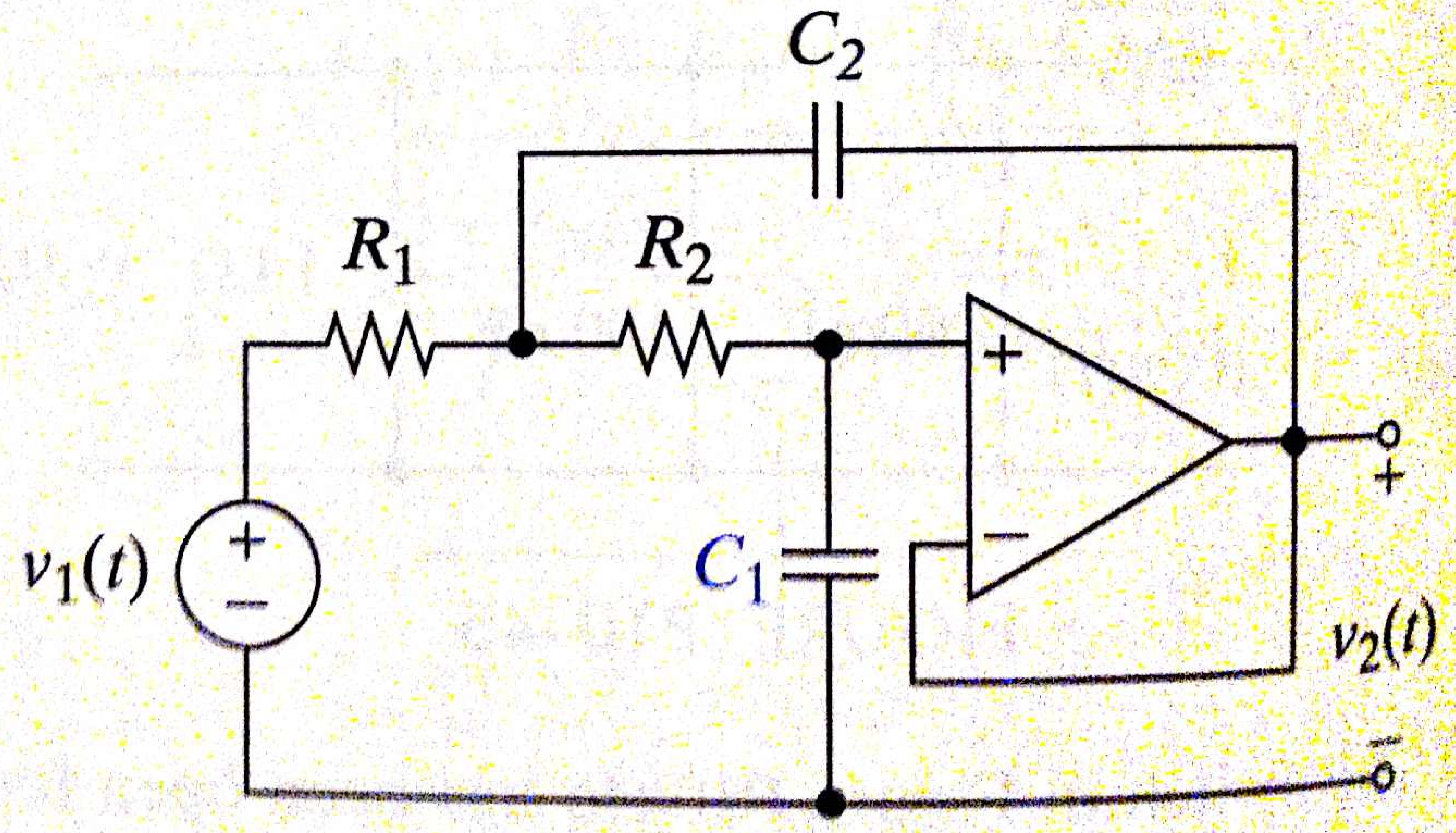


FIGURE P10–55

11–5 Find the voltage transfer function $T_V(s) = V_2(s)/V_1(s)$ in Figure P11–5.

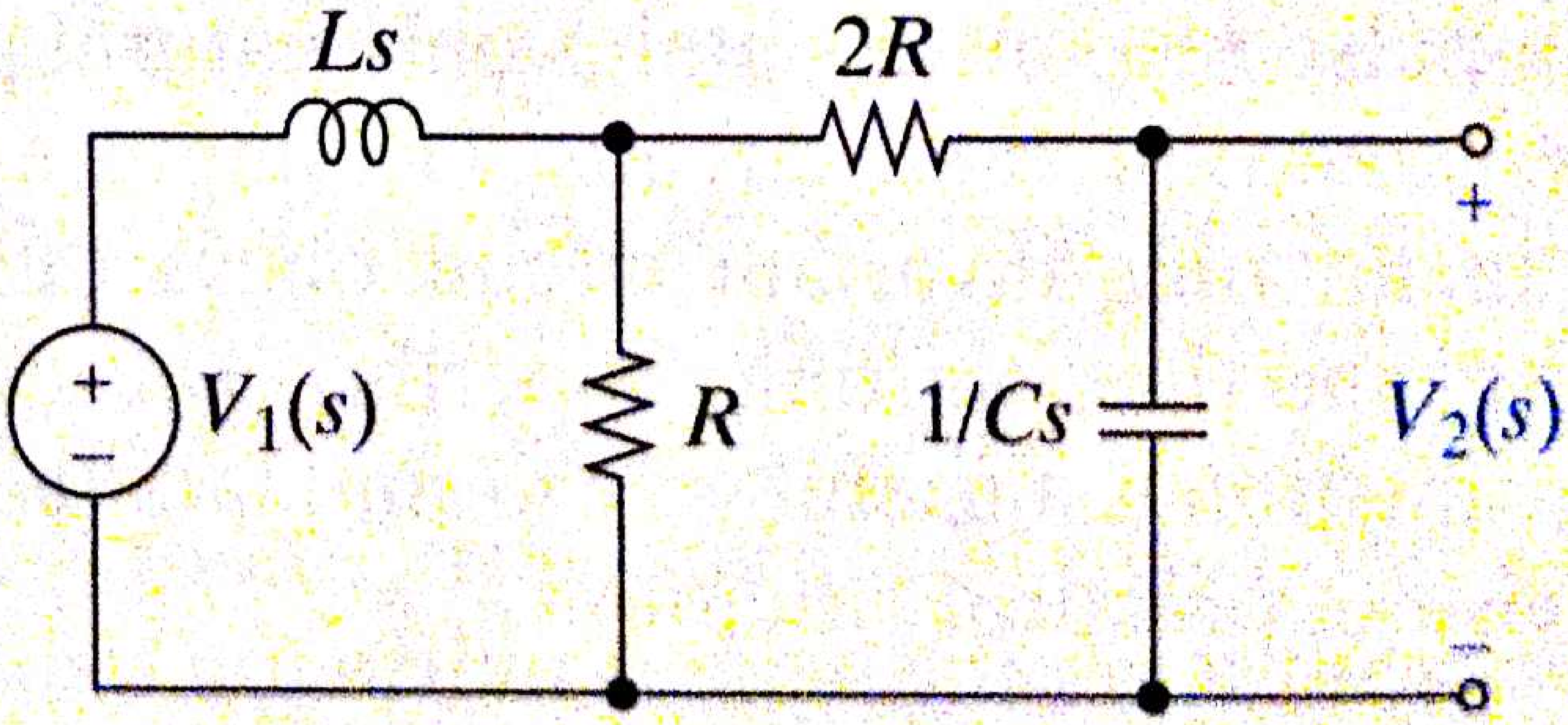


FIGURE P11–5

11-7 **D** Find the voltage transfer function $T_V(s) = V_2(s)/V_1(s)$ for Figure P11–7. Select values of R and C so that $T_V(s)$ has a pole at $s = -1$ krad/s.

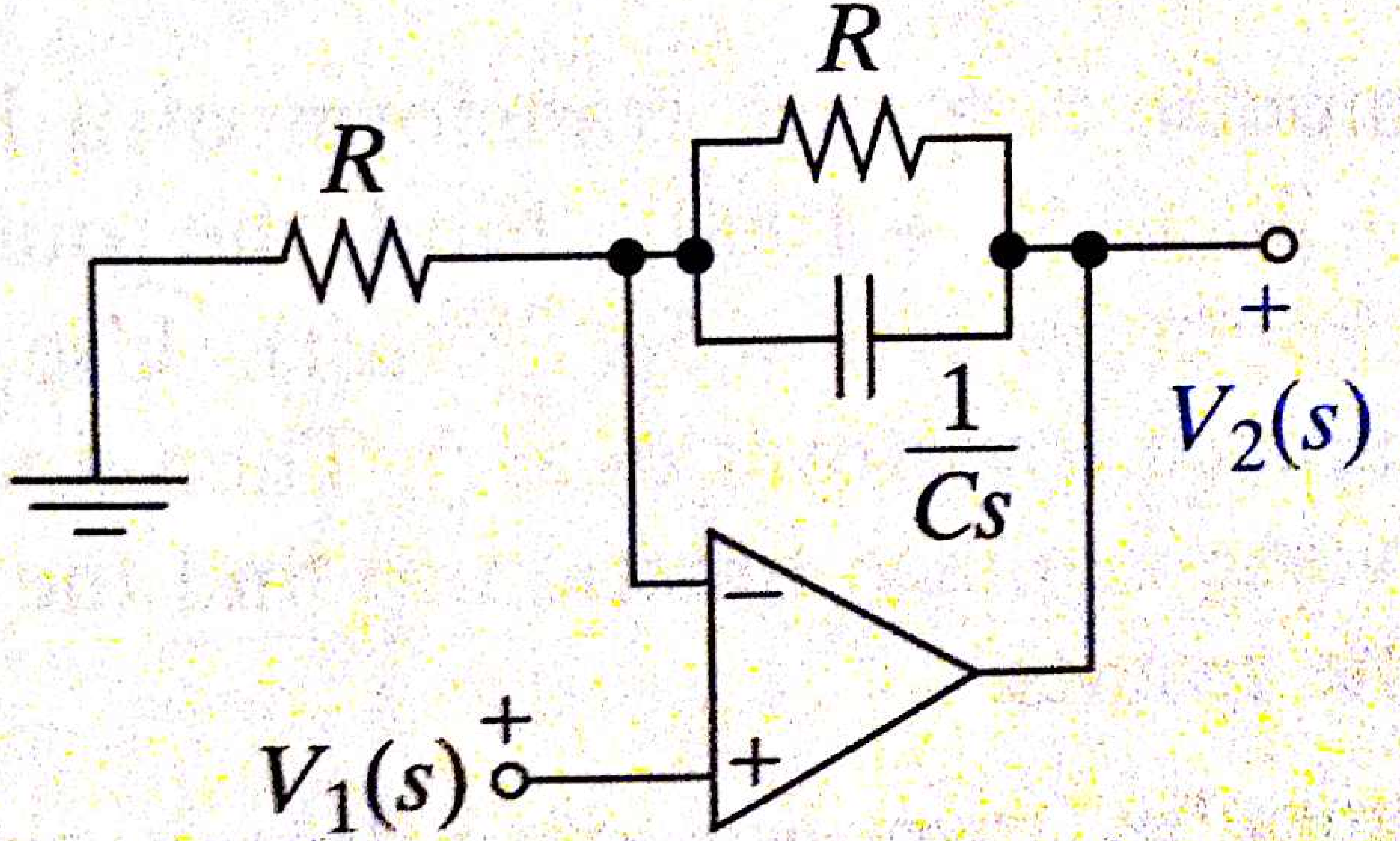


FIGURE P11–7

11–9 Find the voltage transfer function $T_V(s) = V_2(s)/V_1(s)$ of the cascade connection in Figure P11–9. Locate the poles and zeros of the transfer function.

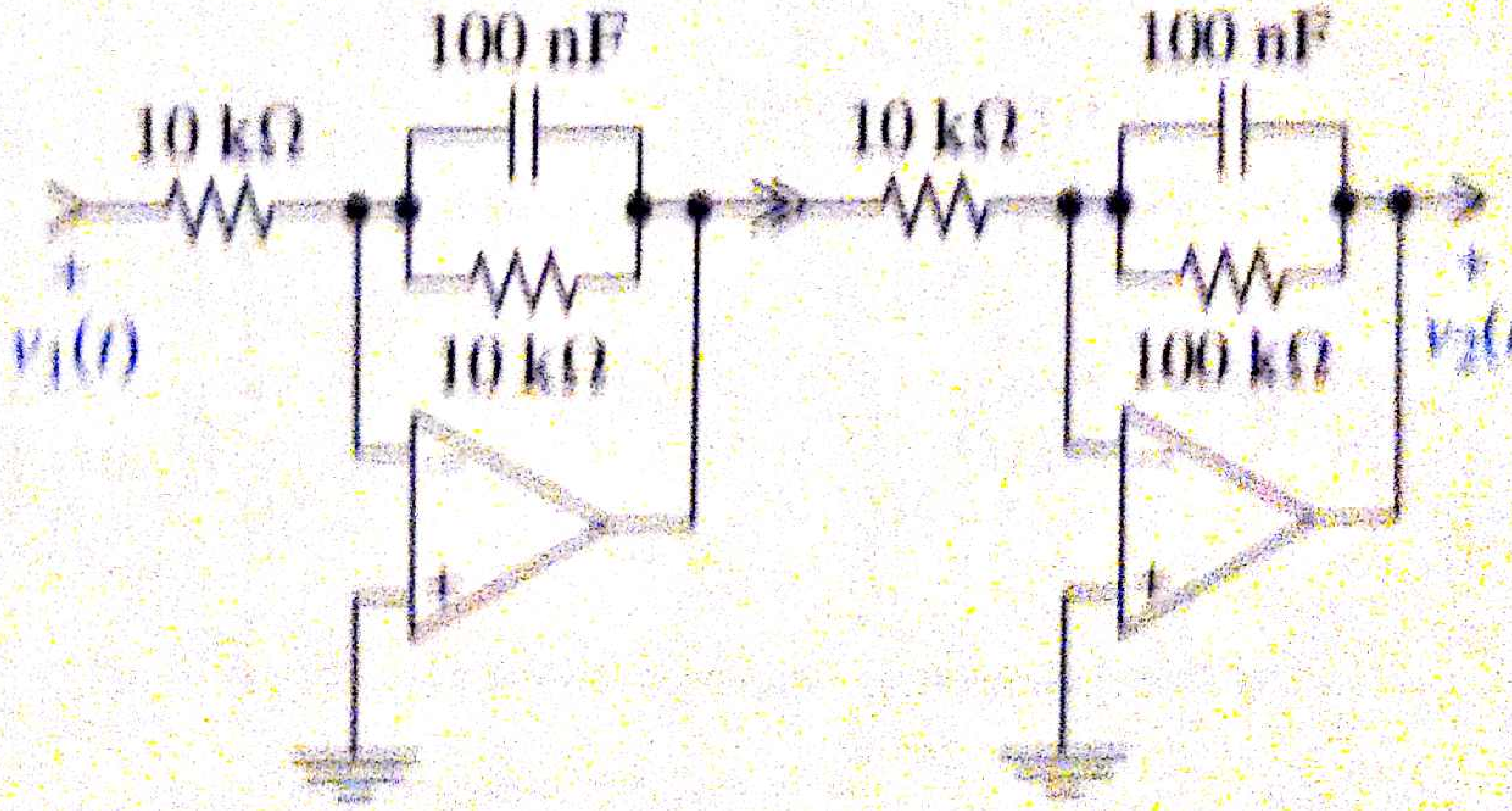


FIGURE P11–9

11-27 The circuit in Figure P11–27 is in the steady state with $v_1(t) = 10 \cos 2000t$ V. Find $v_{2SS}(t)$. Repeat for $v_1(t) = 3 \cos 10kt$ V.

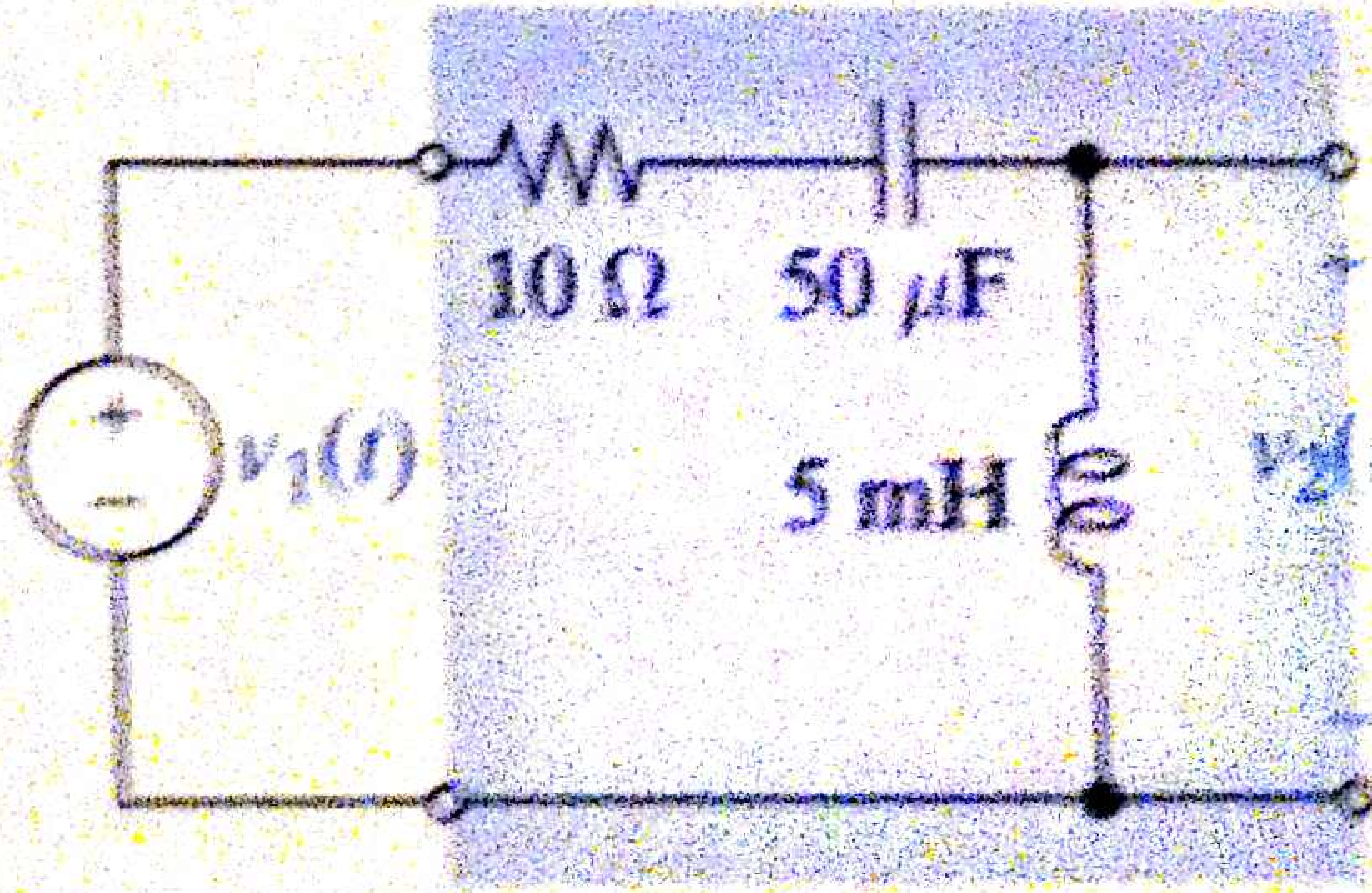


FIGURE P11-27

11–51 D Design a circuit to realize the transfer function below using only resistors, capacitors, and OP AMPs. Scale the circuit so that all resistors are greater than 10 kΩ and all capacitors are less than 1 μF.

$$T_V(s) = \pm \frac{2 \times 10^5}{(s + 100)(s + 10{,}000)}$$

11–59 **E** It is claimed that both circuits in Figure P11–59 realize the transfer function

$$T_V(s) = \frac{\pm 1000s}{(s+1000)(s+4000)}$$

(a) Verify that both circuits realize the specified $T_V(s)$.

(b) Which circuit would you choose if the output must drive a 1-kΩ load?

(c) Which circuit would you choose if the input comes from a 50-Ω source?

(d) It is further claimed that connecting the two circuits in cascade produces an overall transfer function of $[T_V(s)]^2$ no

12–3 Find the transfer function $T_V(s) = V_2(s)/V_1(s)$ of the circuit in Figure P12–3.

(a) Find the dc gain, infinite frequency gain, and cutoff frequency. Identify the type of gain response.

(b) Sketch the straight-line approximation of the gain response.

(c) Calculate the gain at $\omega = 0.5\omega_C$, ω_C, and $2\omega_C$.

(d) Use OrCAD to plot the Bode magnitude gain response of the circuit. Validate your answers for part (c).

(e) What element values would you change to increase the passband gain to 10?

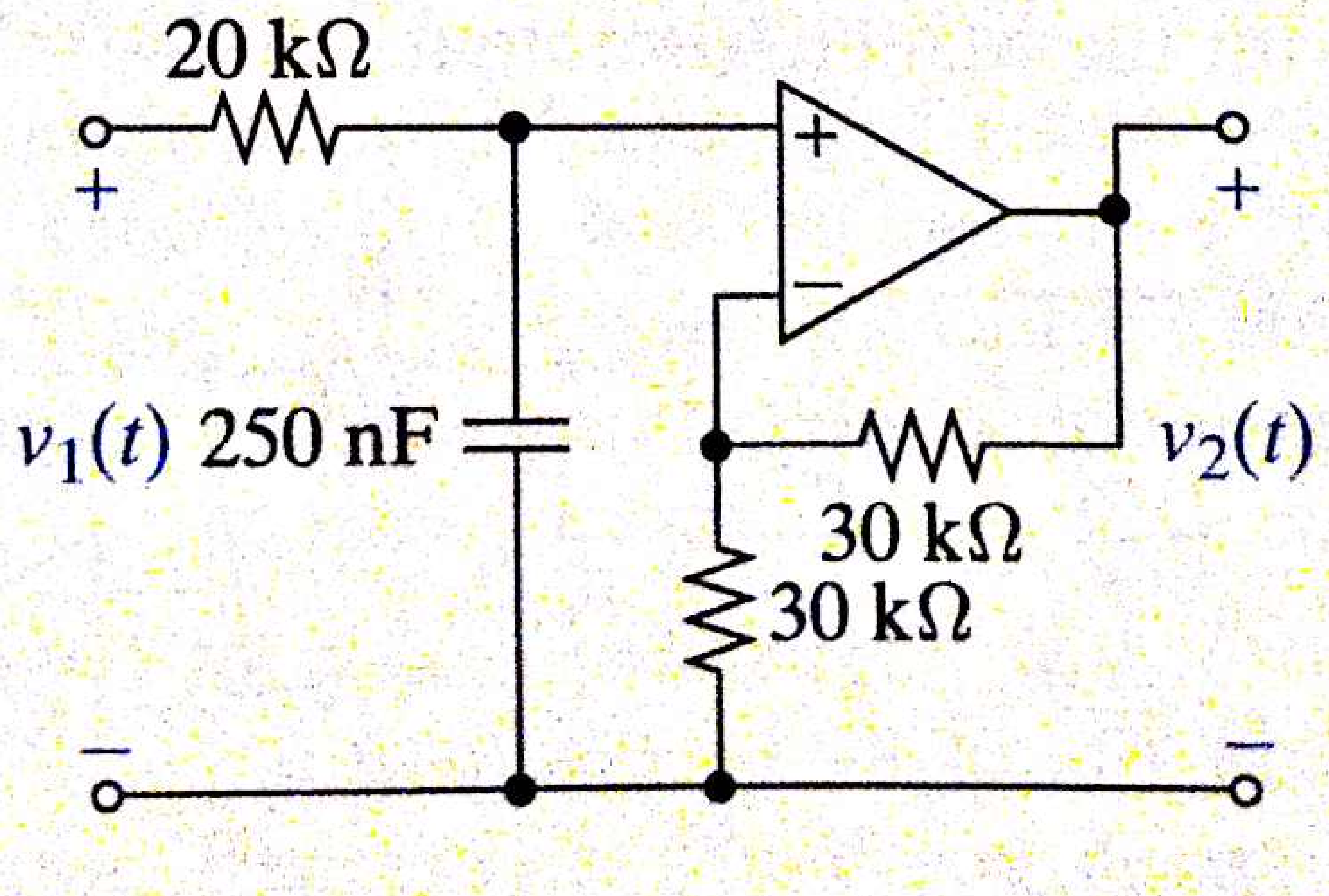


FIGURE P12–3

FIGURE P12–14

12–15 **D** Repeat Problem 12–14 for the circuit in Figure P12–15. Use OrCAD to validate your design.

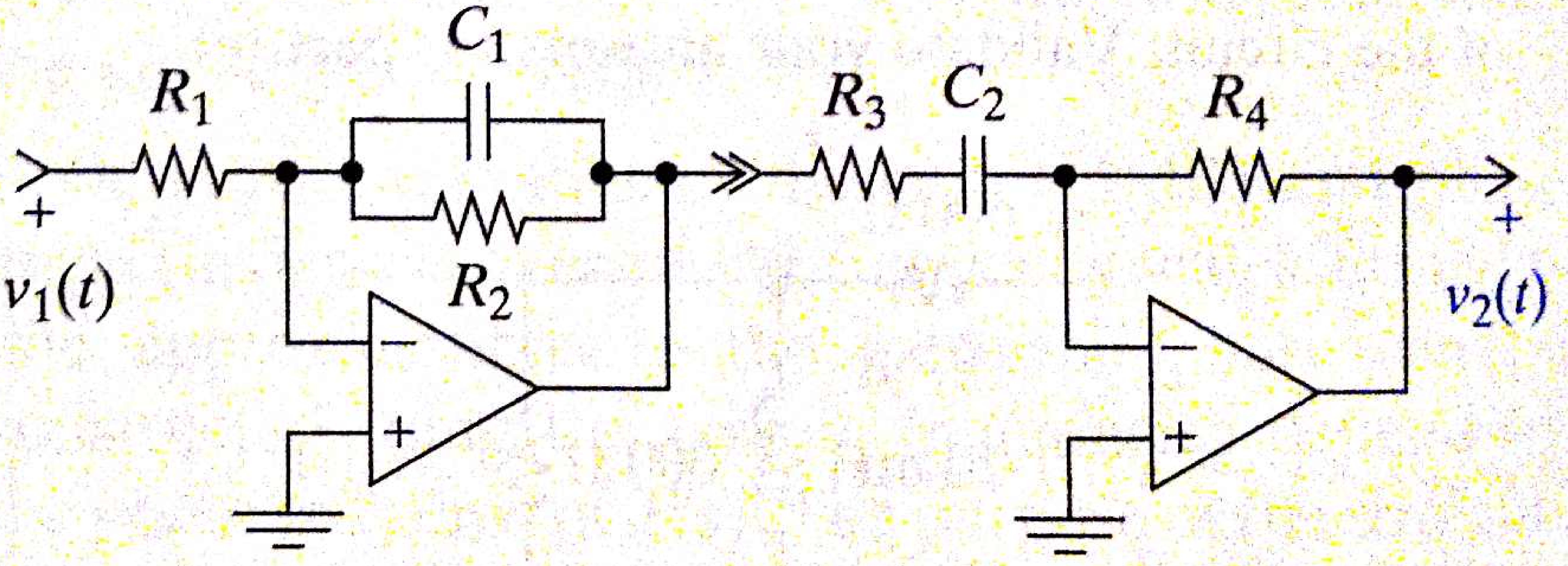


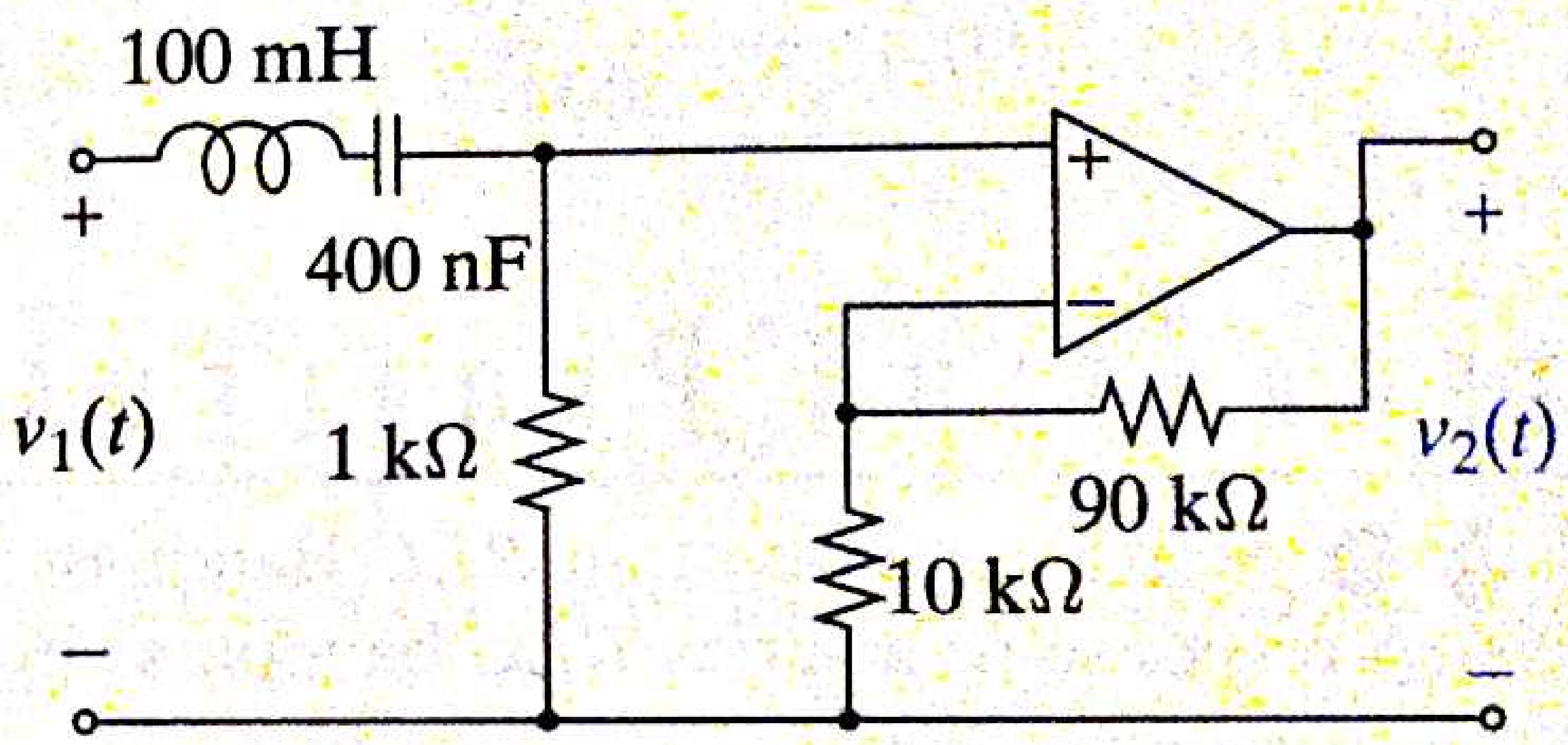
FIGURE P12–15

12–57 E Design Evaluation

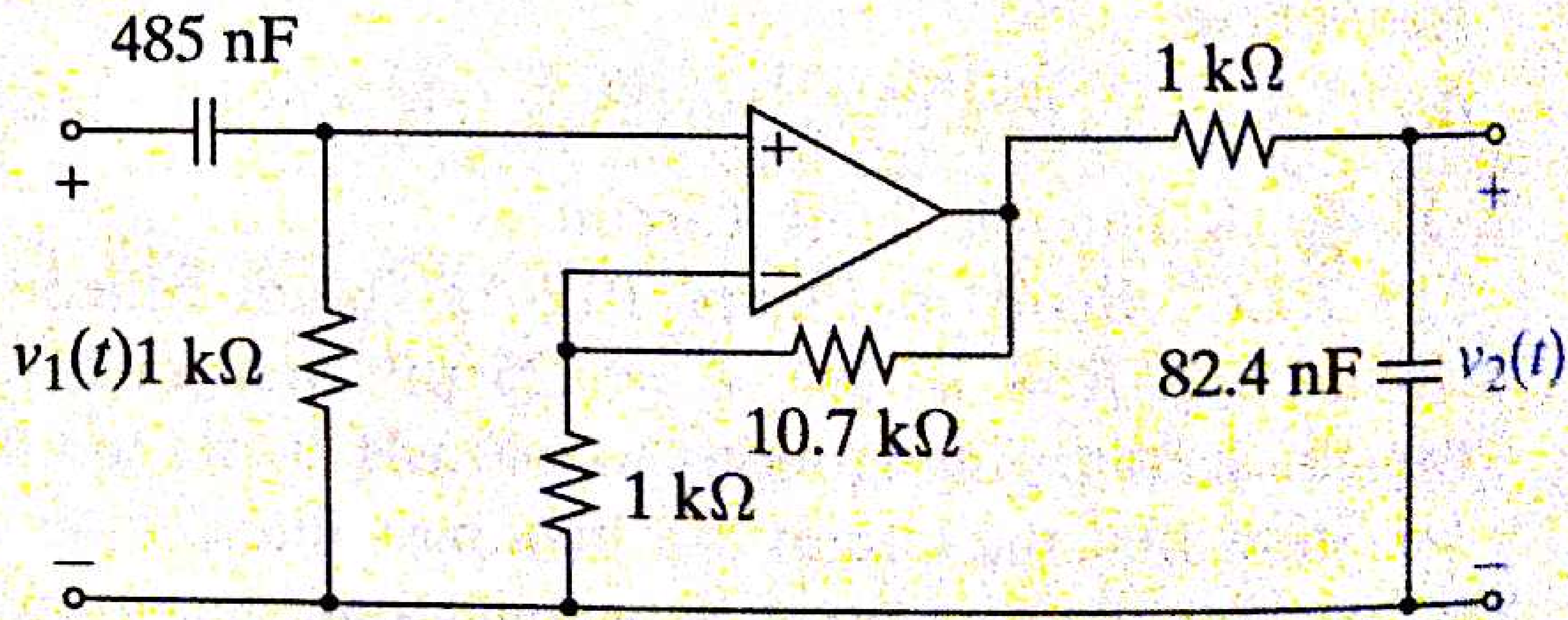
In a research laboratory, you need a bandpass filter to meet the following requirements:

Design requirements: Passband gain: $10 \pm 5\%$, $B = 10\text{ krad/s} \pm 5\%$, $\omega_0 = 5\text{ krad/s} \pm 2\%$, $\omega_{CL} = 2\text{ krad/s} \pm 10\%$.

Evaluation criteria: Filter performance, parts count, use of standard parts, and cost. The two vendors have responded with the designs shown in Figure P12–57. As a research assistant, your supervisor asks you to evaluate the two designs and recommend a vendor. Which vendor would you recommend and why?



Vendor #1



Vendor #2

FIGURE P12–57