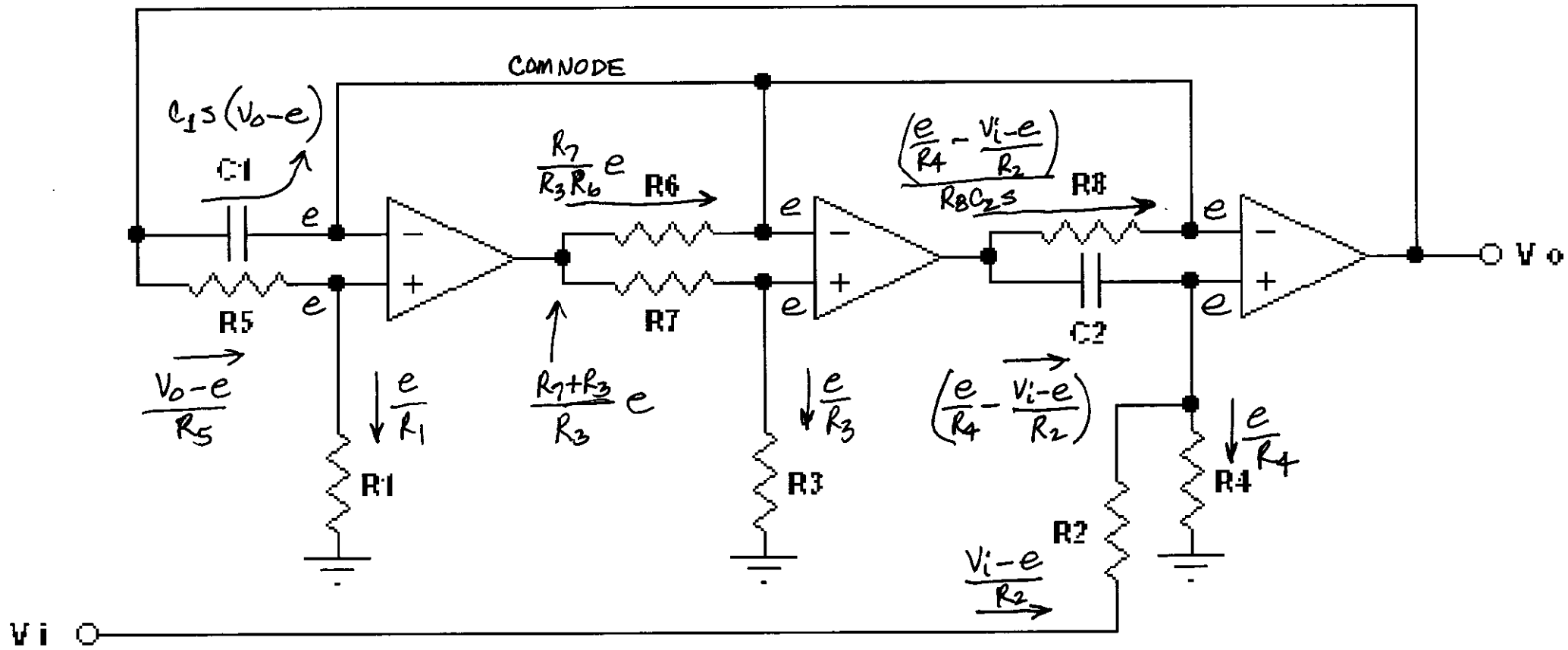


Mikhael-Bhattacharyya Filter



JAS
11/12/2005

SUM OF CURRENTS INTO "COMMON NODE" IS ZERO:

$$C_1 s (V_o - e) + \frac{R_7}{R_3 R_6} e + \frac{\left(\frac{e}{R_4} - \frac{V_i - e}{R_2}\right)}{R_8 C_2 s} \equiv 0$$

$$\textcircled{1} C_1 s V_o - \frac{V_i}{R_2 R_8 C_2 s} = e \left[C_1 s - \frac{R_7}{R_3 R_6} - \frac{1}{R_4 R_8 C_2 s} - \frac{1}{R_2 R_8 C_2 s} \right]$$

ALSO:

$$\frac{V_o - e}{R_5} = \frac{e}{R_1} \rightarrow \frac{V_o}{R_5} = e \left[\frac{1}{R_1} + \frac{1}{R_5} \right] = e \left[\frac{R_1 + R_5}{R_1 R_5} \right] \rightarrow e = \frac{R_1}{R_1 + R_5} V_o \textcircled{2}$$

SUBSTITUTING $\textcircled{2}$ INTO $\textcircled{1}$:

$$\textcircled{3} C_1 s V_o - \frac{V_i}{R_2 R_8 C_2 s} = \frac{R_1}{R_1 + R_5} V_o \left[C_1 s - \frac{R_7}{R_3 R_6} - \frac{1}{R_4 R_8 C_2 s} - \frac{1}{R_2 R_8 C_2 s} \right]$$

REARRANGING:

$$\textcircled{4} V_o \left[C_1 s - \frac{R_1}{R_1 + R_5} C_1 s + \frac{R_1 R_7}{(R_1 + R_5) R_3 R_6} + \frac{R_1}{(R_1 + R_5) R_4 R_8 C_2 s} + \frac{R_1}{(R_1 + R_5) R_2 R_8 C_2 s} \right] = \frac{V_i}{R_2 R_8 C_2 s}$$

MULTIPLY THRU BY $R_2 R_8 C_2 s$:

$$\textcircled{5} V_o \left[R_2 R_8 C_1 C_2 s^2 \left(\frac{R_5}{R_1 + R_5} \right) + \frac{R_1 R_7 R_2 R_8 C_2 s}{(R_1 + R_5) R_3 R_6} + \frac{R_1 R_2}{(R_1 + R_5) R_4} + \frac{R_1}{R_1 + R_5} \right] = V_i$$

JPM
11/12/2005