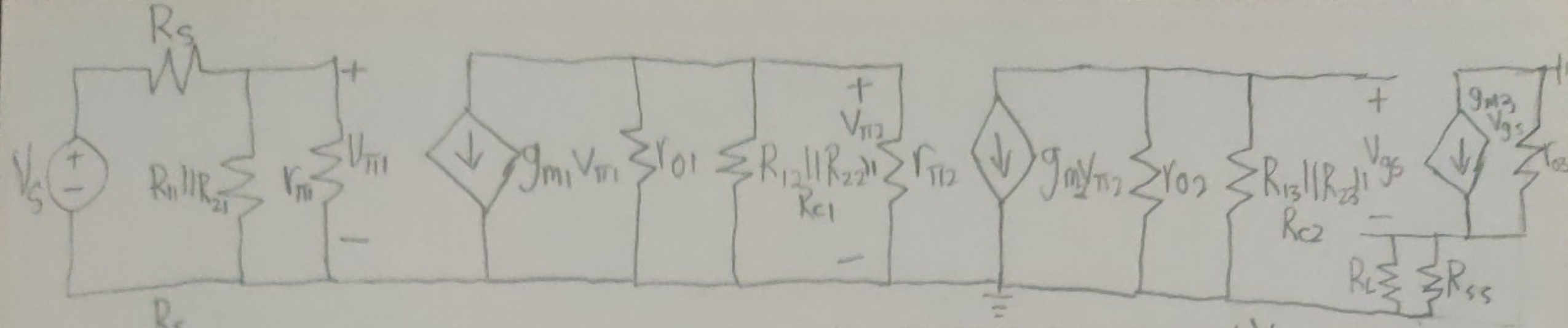

$$V_o = g_{m3} V_{gs} (R_L \| R_{ss} \| r_{o3})$$

$$V_i = V_s$$

$$V_{\pi 1} = V_s \frac{R_{11} \| R_{21} \| r_{\pi 1}}{R_{11} \| R_{21} \| r_{\pi 1} + R_s} \Rightarrow V_s = \frac{V_{\pi 1}(R_s + R_{11} \| R_{21} \| r_{\pi 1})}{R_{11} \| R_{21} \| r_{\pi 1}}$$

$$V_g = -g_{m1} V_{\pi 1} (r_{o1} \| R_{12} \| R_{22} \| R_{c1} \| r_{\pi 2}) - V_{\pi 2} \quad -(1) \Rightarrow V_{\pi 1} = \frac{-V_{\pi 2}}{g_{m1}(r_{o1} \| R_{c1} \| R_{12} \| R_{22} \| r_{\pi 2})}$$

$$V_g = -g_{m2} V_{\pi 2} (r_{o2} \| R_{13} \| R_{23} \| R_{c2}) - (2) \Rightarrow V_{\pi 2} = -\frac{V_g}{g_{m2}(r_{o2} \| R_{c2} \| R_{13} \| R_{23})}$$

$$V_{gs} = V_g - V_{s(FET)} = V_g - V_o \quad -(3) \Rightarrow V_{gs} = V_g - g_{m3} V_{gs} (r_{o3} \| R'_{ss} \| R_L)$$

$$V_{gs} + g_{m3} V_{gs} (r_{o3} \| R_{ss} \| R_L) = V_g \qquad V_{gs}(1 + g_{m3}(r_{o3} \| R_{ss} \| R_L)) = V_g$$

$$V_{gs} = \frac{V_g}{1 + g_{m3}(r_{o3} \| R_{ss} \| R_L)}$$

Sub ① into V_s

$$V_s = \frac{-V_{\pi 2}(R_s + R_{11} \| R_{21} \| r_{\pi 1})}{g_{m1}(R_{11} \| R_{21} \| r_{\pi 1})(r_{o1} \| R_{c1} \| R_{12} \| R_{22} \| r_{\pi 2})}$$

Sub ② into V_s

$$V_s = V_i = \frac{V_g (R_{11} \| R_{21} \| r_{\pi 1} + R_s)}{g_{m1} g_{m2} (r_{o1} \| R_{12} \| R_{22} \| R_{c1} \| r_{\pi 2})(r_{o2} \| R_{13} \| R_{23} \| R_{c2})(R_{11} \| R_{21} \| r_{\pi 1})}$$

Sub ③ into V_o

$$V_o = \frac{g_{m3} V_g (r_{o3} \| R_{ss} \| R_L)}{1 + g_{m3}(r_{o3} \| R_{ss} \| R_L)}$$

$$A_V = \frac{V_o}{V_i}$$

$$= \frac{\dfrac{g_{m3} V_g (r_{o3} \| R_{ss} \| R_L)}{1 + g_{m3}(r_{o3} \| R_{ss} \| R_L)}}{V_g (R_{11} \| R_{21} \| r_{\pi 1} + R_s)}$$

$$= \frac{}{g_{m1} g_{m2} (R_{11} \| R_{21} \| r_{\pi 1})(r_{o1} \| R_{c1} \| R_{12} \| R_{22} \| r_{\pi 2})(r_{o2} \| R_{c2} \| R_{13} \| R_{23})}$$

$$- \frac{g_{m1} g_{m2} g_{m3} (R_{11} \| R_{21} \| r_{\pi 1})(r_{o1} \| R_{c1} \| R_{12} \| R_{22} \| r_{\pi 2})(r_{o2} \| R_{c2} \| R_{13} \| R_{23})(r_{o3} \| R_{ss} \| R_L)}{(R_{11} \| R_{21} \| r_{\pi 1} + R_s)(1 + g_{m3}(r_{o3} \| R_{ss} \| R_L))}$$

$$= \frac{327.845m \times 78.654m \times 1.924m \times (1k \| 150 \| 1457.465)(7.624k \| 1k \| 16k \| 18k \| 1.907k) \times (31.785k \| 2k \| 1k \| 16.5k) \times (540.263k \| 180k \| 300)}{(1k \| 150 \| 1457.465 + 8k)(1 + 1.924m \times (540.263k \| 180k \| 300)}$$

$$= \frac{49.613M \times (192.977) \times 513.554 \times 593.364 \times 298.714}{8.193k \times 1..575}$$

$$= 67.537$$