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EECS 215 HW 5

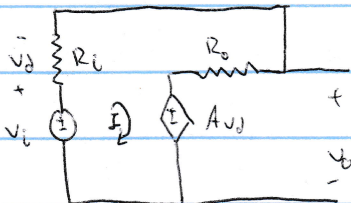
5.  $A = 100,000$

equivalent circuit:

$$R_i = 10,000 \Omega$$

$$R_o = 100,000 \Omega$$

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



$$-V_i + A V_o + (R_i + R_o) I = 0$$

$$-A V_o - R_o I + V_o = 0$$

$$I = \frac{V_i}{R_o + (1+A)R_i}$$

$$V_o = (A R_i + R_o) I$$

$$V_o = (A R_i + R_o) \left( \frac{V_i}{R_o + (1+A)R_i} \right)$$

$$\frac{V_o}{V_i} = \frac{A R_i + R_o}{R_o + (1+A)R_i} = \frac{100,000 \cdot 10,000 + 100}{100 + 100,001 \cdot 10,000} = 0.99999$$

18. inverting amp

$$V_{TH} = V_{ab} = -\frac{R_f}{R_i} V_i = -\frac{10,000}{10,000} \cdot 9 = -9V$$

$$21. \frac{4-2}{4000} = \frac{2-V_o}{10000}$$

$$V_o = -3V$$

$$39. \text{ Summing amplifier: } V_o = -\left( \frac{R_f}{R_1} V_1 + \frac{R_f}{R_2} V_2 + \frac{R_f}{R_3} V_3 \right) = -16.5 = -\left( \frac{50k}{10k} (-3) + \frac{50k}{20k} V_2 + \frac{50k}{50k} (5) \right)$$

$$V_2 = 10.6V$$

47. difference amplifier:  ~~$V_o = \frac{R_2}{R_1} \left( 1 + \frac{R_1}{R_2} \right) v_2 - \frac{R_2}{R_1} v_1$~~

~~Ans~~

$$V_o = \frac{30k(1 + \frac{2k}{30k}) \cdot 2}{2k(1 + \frac{2k}{20k})} - \frac{30k}{2k} = \boxed{14.09V}$$

66. inner amp:  $V_o = -\frac{R_f}{R_i} v_i = -\frac{40}{20}(4) = -8V$

outer amp:  $V_o = -(R_f/R_1 \cdot v_1 + R_f/R_2 \cdot v_2 + R_f/R_3 \cdot v_3)$

$$= -(100/25 \cdot 6 + 100/20(-8) + 100/10 \cdot 2)$$

$$= \boxed{-4V}$$