

Analog Tümdevreler
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Çözüm

$$a) \quad I_{C1} = I_{C2} = \frac{I_{EE}}{2} = 50\mu A = I_C \quad I_{C3} \approx I_{C4} = -50\mu A$$

$$g_{m1-2} = \frac{I_C}{V_T} = \frac{50\mu A}{26mV} = \frac{1}{520} mho = 1.92 \times 10^{-3} mho \quad r_{o4} = \frac{V_{AP}}{I_C} = 1M\Omega \quad r_{o2} = \frac{V_{AN}}{I_C} = 2.6M\Omega$$

$$R_o = r_{o2} // r_{o4} = 722k\Omega$$

$$K_V = g_{m1-2} \cdot R_o = \frac{1}{520} mho \times 722 k\Omega = 1388$$

veya

$$K_V = \frac{V_{AN} \cdot V_{AP}}{V_T \cdot (V_{AN} + V_{AP})} = \frac{130V \times 50V}{0.026V \cdot (130V + 50V)} = 1388$$

b) Fark işaret giriş direnci

$$R_{id} = 2\beta_{FN} r_{e1-2} = \frac{2\beta_{FN}}{g_{m1-2}} = 2 \times 200 \times 520\Omega = 208k\Omega$$

b) $I_L = 5\mu A$ için giriş dengesizlik gerilimi

$$V_{OS} = V_T \cdot \left[\frac{2}{\beta_{FP}} + \frac{I_L}{I_C} \right] = 26mV \cdot \left[\frac{2}{50} + \frac{5\mu A}{50\mu A} \right] = 3.64mV$$