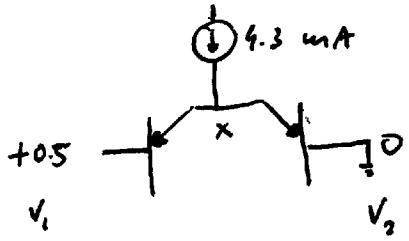
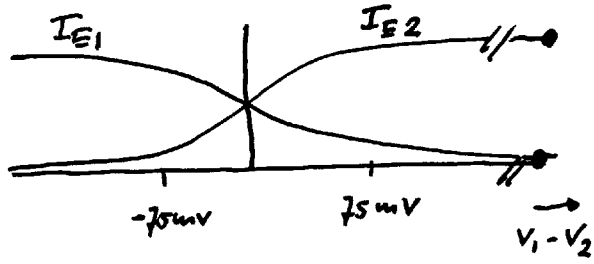
Electrónica II Folhas de problemas 2

1: see lecture notes

2:





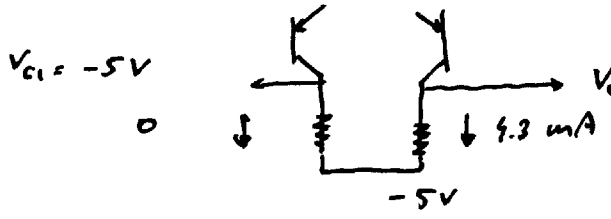
$V_1 - V_2 = 500\ mV \rightarrow I_{E2} \sim 4.3\ mA,\ I_{E1} = 0$

$V_x = V_{E1} = V_{E2} = +0.7\ V$

$V_{BE1} = 0.2\ V$ (closed)

$V_{BE2} = 0.7\ V$ (open)

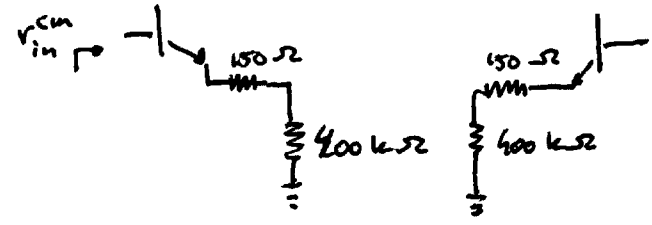
$I_{C1} = 0,\ I_{C2} = 4.3\ mA$



$V_{E2} = -5\ V + 4.3\ mA \times 1\ k\Omega = +0.7\ V$

3:

a)



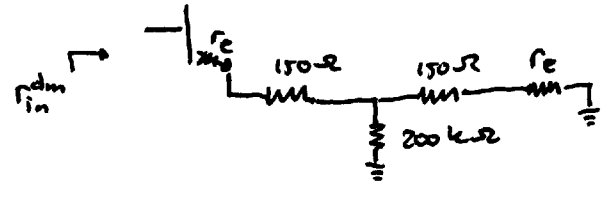
$r_{in}^{cm} = (\beta+1) \cdot [r_e + 150\ \Omega + 400\ k\Omega]$

$\approx 40\ M\Omega$

$r_e = \frac{V_T}{I_E} = \frac{25\ mV}{0.5\ mA} = 50\ \Omega$

$r_o = \frac{V_A}{I_C} = \frac{100\ V}{0.5\ mA} = 200\ k\Omega$

b)



$r_{in}^{dm} = (\beta+1)[r_e + 150\ \Omega + (150\ \Omega + r_e) \,//\, 200\ k\Omega]$

$\approx (\beta+1) \cdot 2\ (50\ \Omega + 150\ \Omega) = 40\ k\Omega$

c) $A_{dm} = \dfrac{10\,k\Omega}{(r_e + 150\Omega) + (r_e + 150\Omega) \,/\!/\, 200\,k\Omega}$

$\approx \dfrac{10\,k\Omega}{2\,(r_e + 150\Omega)} = 25$

d) $A_{cm} = \dfrac{10\,k\Omega}{r_e + 150\Omega + 400\,k\Omega} \approx \dfrac{1}{40}$

e) $CMRR \equiv \left| \dfrac{A_{dm}}{A_{cm}} \right| = \dfrac{25}{1/40} = 1000$

$(= 30\ dB \quad [or \quad 60\ dB \quad power])$

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