QUIZ NO. 11

(Average score = 8.1/10 of those taking the quiz)

A series-shunt feedback amplifier is shown. Use the methods of feedback analysis to find the numerical values of $v_2/v_1, v_1/i_1$, and $v_2/i_2$. Assume that all transistors are matched and that $\beta = 100$, $r_\pi = 10k\Omega$ and $r_o = \infty$.

Solution

The circuit can redrawn as shown to identify more clearly the A circuit and the feedback circuit.

The closed-loop gain is

$$A_F = \frac{v_2}{v_1} = \frac{A}{1+AB} = \frac{245.53}{1+245.53(0.1)} = \frac{245.53}{25.53} = 9.61 \text{ V/V}$$

The open-loop input resistance is $R_i = r_\pi + (1+\beta)(R_1||R_3) = 101.8k\Omega$

$$R_{in} = \frac{v_1}{i_1} = R_i(1+AF) = 101.8k\Omega(25.53) = 2.60\text{MO}$$

The open-loop output resistance is $R_o = R_4||R_1+R_3) = 5k\Omega$

$$R_{out} = \frac{v_2}{i_2} = \frac{R_o}{1+AF} = \frac{5k\Omega}{25.53} = 196 \Omega$$