

Problem: A voltage-series negative feedback amplifier has a voltage gain without feedback of $A = 500$, input resistance $R_i = 3\text{ k}\Omega$, output resistance $R_o = 20\text{ k}\Omega$ and feedback ratio $\beta = 0.01$. Calculate the voltage gain A_f , input resistance R_{if} and output resistance R_{of} of the amplifier with feedback.

Solution: $A = 500$, $R_i = 3\text{ k}\Omega$, $R_o = 20\text{ k}\Omega$ and $\beta = 0.01$

$$\text{voltage gain } A_f = \frac{A}{1 + A\beta} = \frac{500}{1 + (500 \times 0.01)} = 83.3$$

$$\text{Input resistance } R_{if} = (1 + A\beta) R_i = (1 + 500 \times 0.01) \times 10^3 \\ = 18\text{ k}\Omega.$$

$$\text{output resistance } R_{of} = \frac{R_o}{1 + A\beta} = \frac{20 \times 10^3}{1 + 500 \times 0.01} = 3.33\text{ k}\Omega$$