



$$\frac{V_o^*}{V_s} = \frac{R_i}{R_s + R_i} \times A_v \times \frac{R_L}{R_L + R_o}$$

$$\frac{V_o}{V_s} = \frac{1}{2} \frac{V_o^*}{V_s} =$$

$$\frac{R_i}{R_i + R_s} = \frac{1}{2} \frac{R_i}{R_i + R_s}$$

$$\frac{R_i}{R_i + R_s} = \frac{20}{120} = \frac{1}{6}$$

$$\frac{R_i}{100K + R_i} = \frac{1}{12}$$

$$R_s = 100K$$

$$R_i = 20K\Omega$$

$$12R_i = 100K + R_i$$

$$11R_i = 100K$$

$$R_i = 100K / 11 = 9.09K\Omega$$

$$R^* = 20K\Omega \quad R_{des} // 20K\Omega = 9.09K$$

$$\frac{R_{des} \times R_i}{R_{des} + R_i} = 9.09K$$

$$R_{des} \times R_i = 9.09K R_{des} + 7.07K R_i$$

$$R_{des} (R_i - 9.09K) = 9.09K \times R_i$$

$$R_{des} = \frac{9.09K \times 20K}{20K - 9.09K}$$

$$= \underline{\underline{16.67K\Omega}}$$



