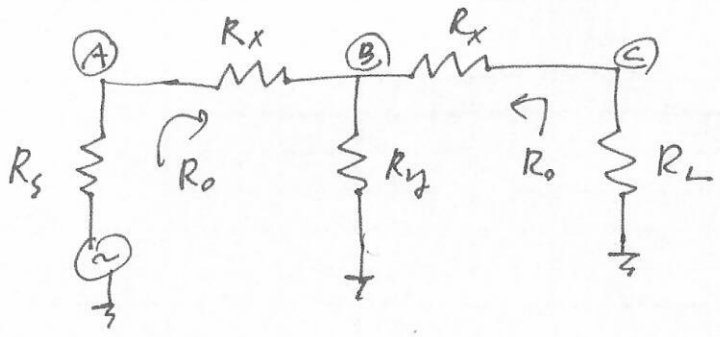

$R_S = R_L = R_0$

1) $R_S \longrightarrow \overline{V_{R_S}} = \sqrt{4KTR_S\Delta f}$

$\Rightarrow V_A = \frac{1}{2}\overline{V_{R_S}}$

$\Rightarrow V_B = \frac{R_0 - R_x}{R_x + (R_0 - R_x)} \cdot V_A = \frac{R_0 - R_x}{R_0}\frac{1}{2}\overline{V_{R_S}}$

$\Rightarrow V_C = \frac{R_L}{R_x + R_L} V_B = \frac{R_0 - R_x}{R_0 + R_x}\frac{1}{2}\overline{V_{R_S}}$

$\therefore$ Noise power due to R_S across R_L is

$$P_L\Big|_{\text{due to } R_S} = \frac{V_C^2}{R_L} = \frac{\overline{V_{R_S}}^2}{4R_L}\left(\frac{R_0 - R_x}{R_0 + R_x}\right)^2 = KT\Delta f\frac{1}{2}$$

2) ① R_x at left side $\longrightarrow \overline{V_{R_x}} = \sqrt{4KTR_x\Delta f}$

$\Rightarrow$ Follow the same steps in 1)

$\Rightarrow$ Noise power across R_L due to R_x at left side is

$$P_L\Big|_{\text{due to } R_x} = \frac{\overline{V_{R_x}}^2}{4R_0}\left(\frac{R_0 - R_x}{R_0 + R_x}\right)^2 = KT\Delta f\frac{R_x}{R_0}\cdot\frac{1}{2}$$