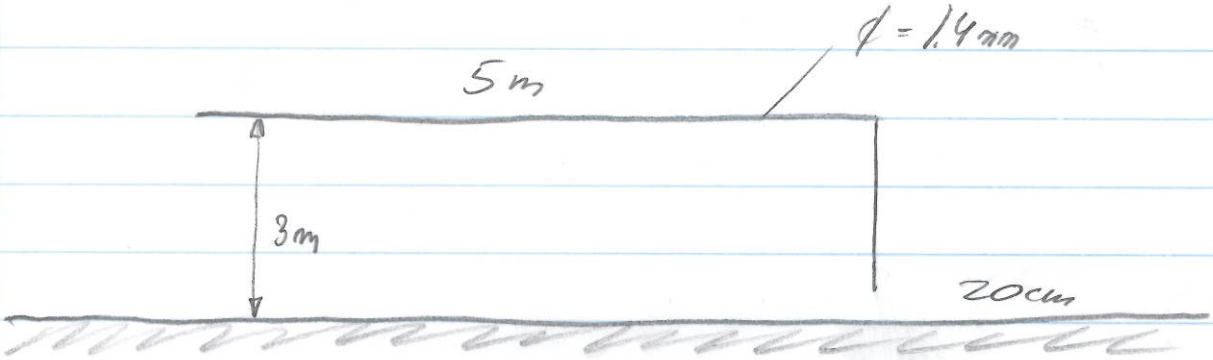
15/3 -2005
CLB

HV 4

1.



Kuffel p. 165

$$A = \ln\left(\frac{4 \cdot 3}{1.4 \cdot 10^{-3}}\right) - \ln\frac{1}{2}\left(1 + \sqrt{1 + \left(\frac{2 \cdot 3}{5}\right)^2}\right)$$

$$A = 9{,}056 - 0{,}248 = 8{,}81$$

$$Z_{L\,hor} = 60 \cdot A = 60 \cdot 8{,}81 = 528\ \Omega$$

$$Z_{L\,vert} \approx 60 \ln\left(\frac{1{,}15 \cdot 2.5}{1.4 \cdot 10^{-3}}\right) = 464\ \Omega$$

$$\varepsilon_{rel} \frac{Z_{L\,hor} - Z_{L\,vert}}{Z_{L\,hor}} = \frac{528 - 464}{528} \cdot 100\% = 12\%$$

2. Kuffel p. 163-167

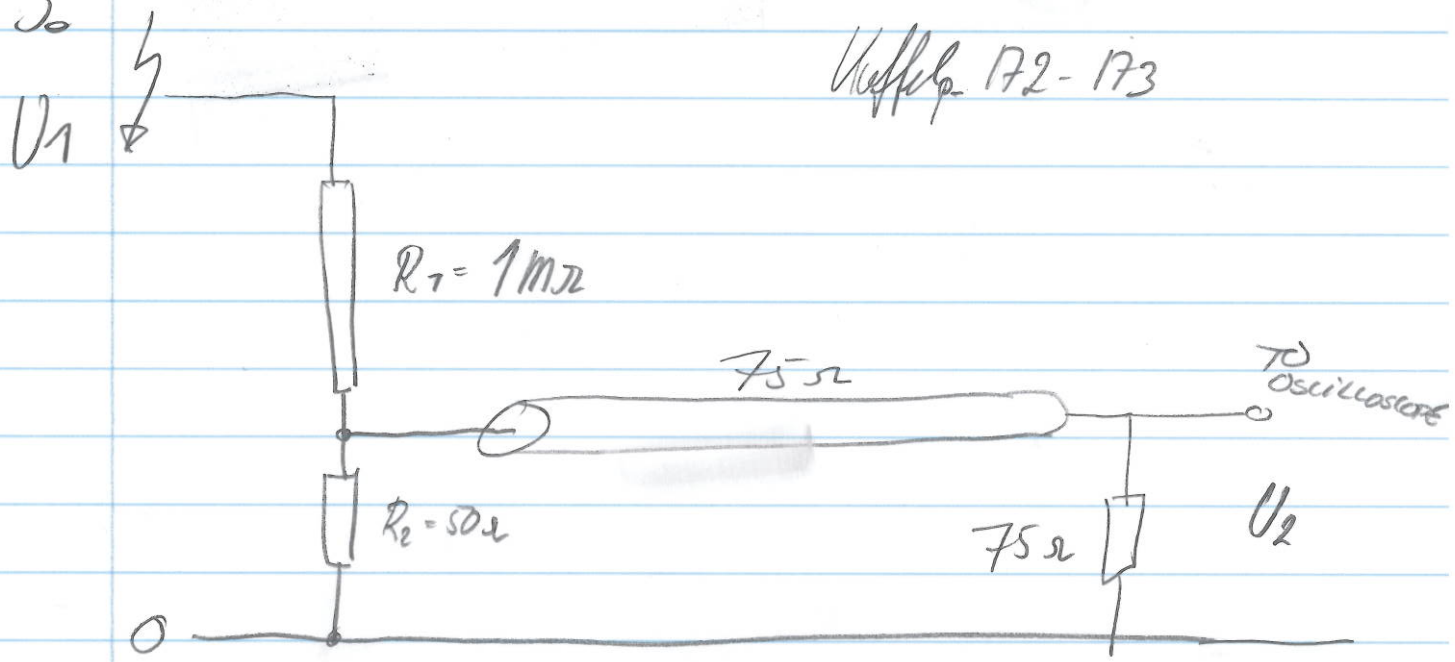
$$T = T_0 - Z_L = \frac{1}{1 + \frac{300}{20000}}\left[300 \cdot 50 \cdot 10^{-12} - 10 \cdot 10^{-3}\left(1 - \frac{300}{20000}\right)\left(1 - \frac{300}{300}\right)\right]$$

$\left(1 - \frac{300}{300}\right) = 0$ as $R_d = Z_L$

$$T = \frac{300 \cdot 50 \cdot 10^{-12}}{1 + \frac{300}{20000}} = 14{,}8\ ns$$

3.

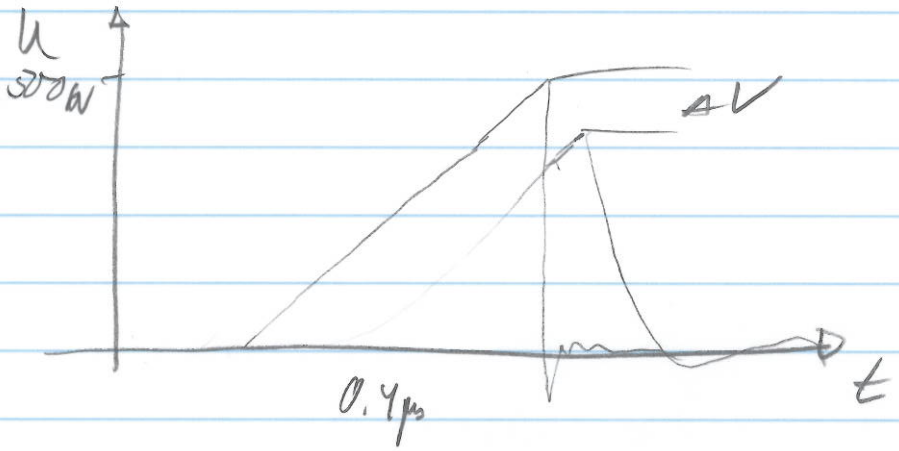
Kuffel p. 172 - 173



$50 // 75 = 30 \Omega$

$$\frac{U_2}{U_1} = \frac{30}{10^6 + 30} \approx 30 \cdot 10^{-6}$$

4.



$$S = \frac{500}{0.4} = 1250 \ kV/\mu s$$

Kuffel p. 135 $\Rightarrow$ $\Delta V = S \cdot T$

$$\Delta V = 1250 \ kV/\mu s \cdot 15 \cdot 10^{-3} = 18.8 \ kV$$