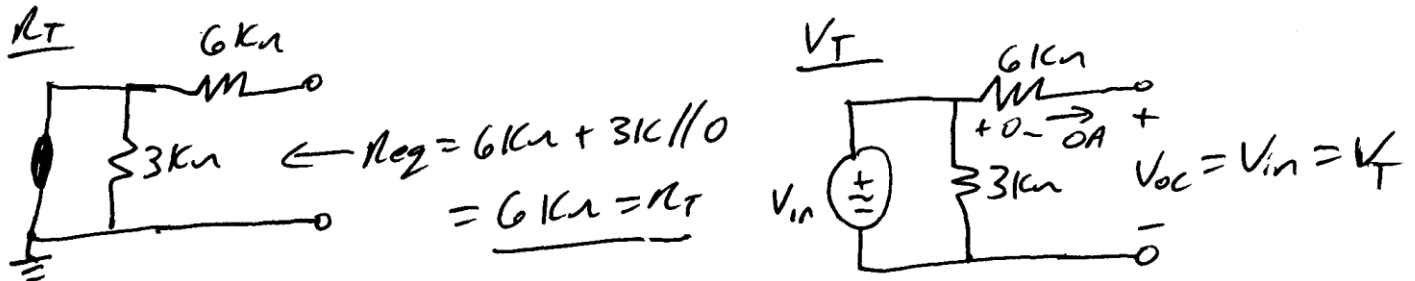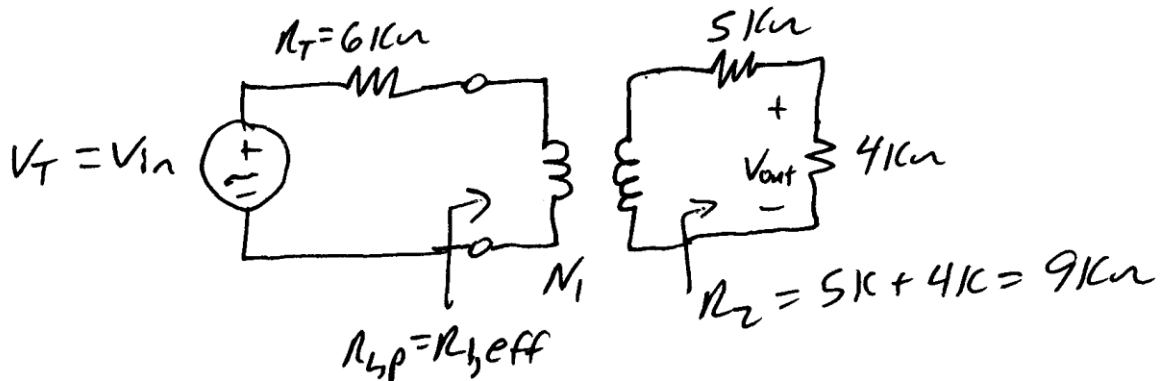The source $V_{in}(t) = 10\cos(2\pi \cdot 3000t)$ V   is connected to an ideal transformer as shown below. Design the transformer so that maximum power is delivered to the 4 kΩ load.

Find Thevenin equiv. of primary side circuit

R_T 6 kΩ

$\leftarrow R_{eq} = 6K\Omega + 3K // 0$
$= 6 K\Omega = R_T$

$3K\Omega$

V_T 6 kΩ

$+ 0 \rightarrow 0A$ $+$

$3K\Omega$ $V_{oc} = V_{in} = V_T$

V_{in} $-$

Simplified transformer circuit

$R_T = 6 K\Omega$ 5 kΩ

$V_T = V_{in}$ $+$

V_{out} $4 K\Omega$

$-$

N_1

$R_{L,p} = R_{1,eff}$ $R_2 = 5K + 4K = 9 K\Omega$

For maximum power transfer to the secondary,

set $R_{L,p} = R_{1,eff} = R_T = 6 K\Omega$. Per Dr. whites

notes (Lecture 9 Ideal Transformer)

$R_{1,eff} = \left(\frac{N_1}{N_2}\right)^2 R_2 = \left(\frac{N_1}{N_2}\right)^2 9K\Omega = 6 K\Omega$

$\hookrightarrow \frac{N_1}{N_2} = \sqrt{6/9} = 0.8165$