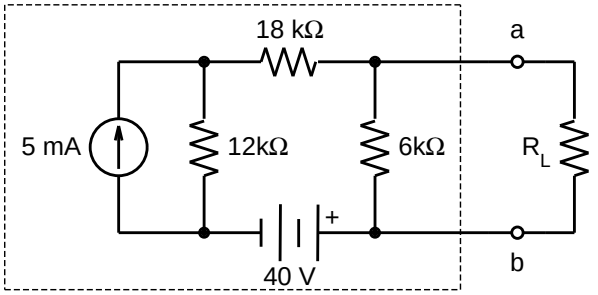
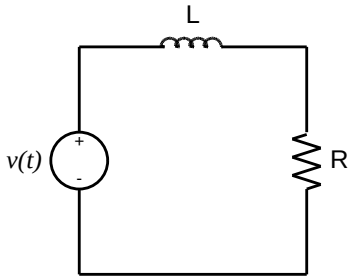
ELEC 243
Problem Set 11
Homework Section
Due: April 17, 2015

H11.1 For the circuit shown, determine the following:

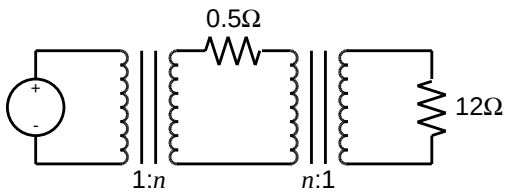
- **(a)** Replace the circuit in the box by a Thévenin equivalent circuit.
- **(b)** Find v_{ab} for R_L = 3kΩ.
- **(c)** What value of R_L receives maximum power from the circuit?
- **(d)** What value of R_L makes the current in the 6kΩ resistor be 0.1mA?



H11.2 With a DC source, $v(t) = 10$Vdc, 5 watts are dissipated in the resistor R. When the DC source is replaced by an AC source, $v(t) = 20\cos(100t)$, the average power dissipated is 5W. Find L.



H11.3 The circuit shown below contains a step-up transformer, a transmission line with a resistance of 0.5Ω, a step-down transformer, and a load of 12Ω. Find the value of n to make the efficiency of the transmission circuit (i.e. the delivery of power from the source to the load) equal to 99%. (Assume the transformers are ideal.)

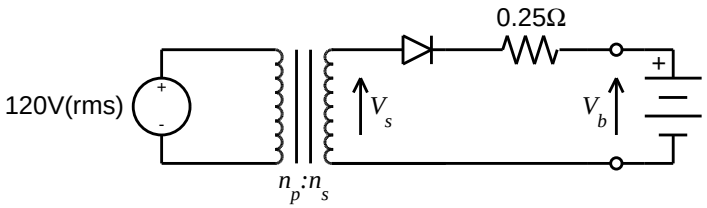


H11.4 The circuit below is a simple battery charger. The current flows when the instantaneous voltage out of the transformer (V_s) exceeds the battery voltage (V_b) plus the diode threshold voltage (V_F). As the battery is charged, its voltage increases until the current stops flowing. For this problem, however, consider the vattery voltage constant at 12.6 V. Assume the diode threshold voltage to be 0.7 V (use the diode model of Figure 10.27 with $r_s = 0$).

(a) Find the peak value of the secondary voltage, V_s such that the peak current in the battery is 10 A.

(b) With this value for V_s, what percent of the time is the diode conducting?

(c) What should be the turns ratio, $n_p : n_s$ for the transformer?



H11.5 In the circuit below:

(a) Find v_1.

(b) Find the power dissipated in each of the resistors.

(c) If the battery has an initial capacity of 90 J and maintains a constant voltage during its life, how long will it last before it is discharged.