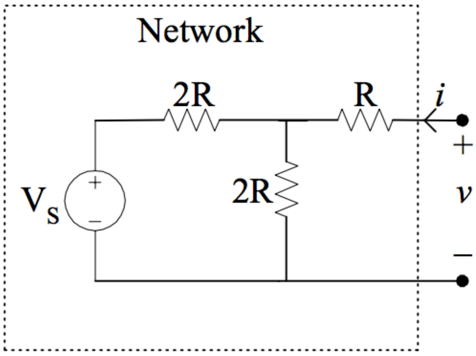
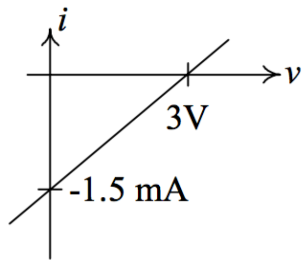
ECE100
Homework-4

Total Points: 100

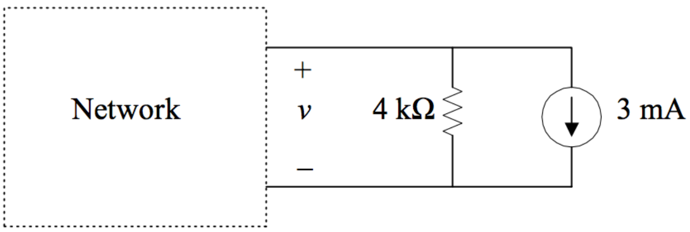
Submit your work in a pdf file electronically in the CCLE website before April 25th 11:59 pm. Late homework will not get credit!

1. A network that is implemented with three resistors and a voltage source as shown below. Its terminal characteristics are also given graphically below. (3 x 4 = 12 points)

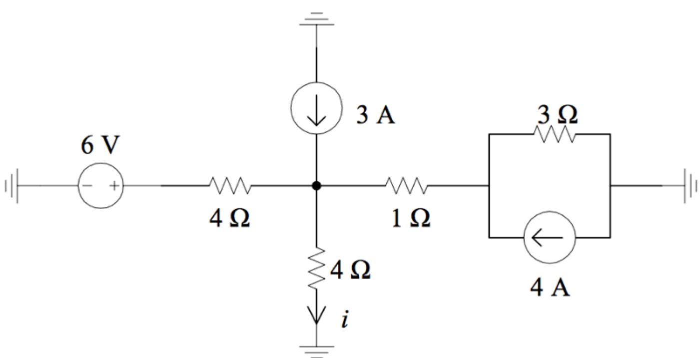




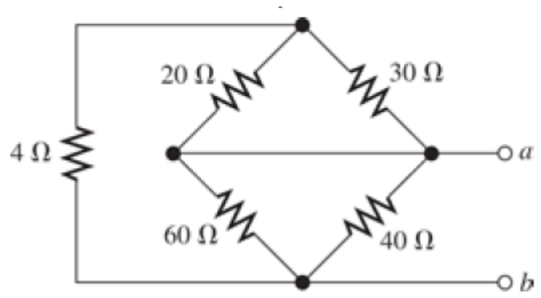
(a) From the graphical data given above, determine numerical values for the parameters of the Thevenin equivalent of the network.
(b) Determine numerical values for the parameters V_S and R that characterize the implementation of the network shown above.
(c) The network is connected to an external current source and resistor as shown below. Determine the value of its terminal voltage v given the external connection.



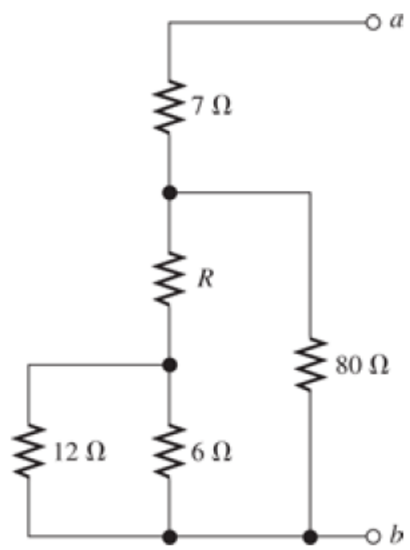
2. Determine the current i in the network below. (8 points)



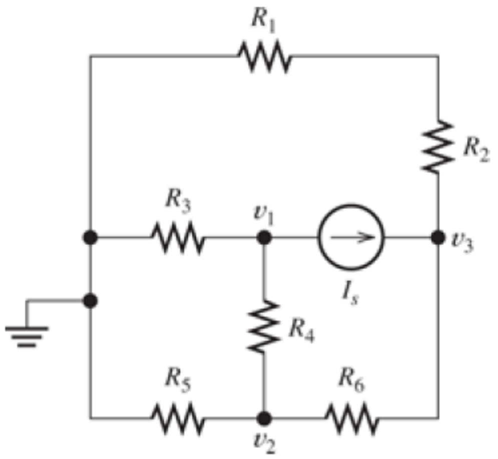
3. Find the equivalent resistance between terminals a and b in Figure below (5 points)



4. The equivalent resistance between terminals a and b in Figure below is 23 ohms. Determine the value of R. (5 points)



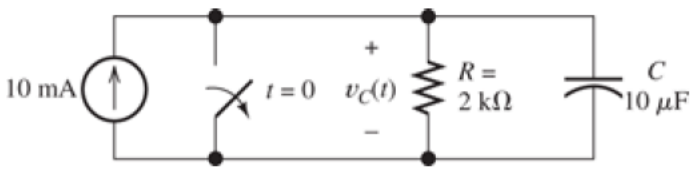
5. Given R1=15 Ω, R2=5 Ω, R3=20 Ω, R4=10 Ω, R5=8 Ω, R6=4 Ω and Is=5 A, solve for the node voltages shown in Figure. (10 points)



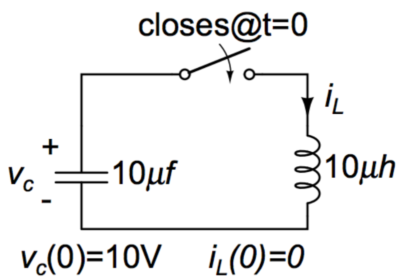
6. Starting from the Norton equivalent circuit (current source I_n in parallel with R_t) with a resistive load attached (R_L), find an expression for the power delivered to the load in terms of I_n, R_t and R_L. Assuming that I_n, R_t are fixed values and that R_L is variable, show that maximum power is delivered for $R_L = R_t$. Find an expression for <u>maximum</u> power delivered to the load in terms of and I_n, R_t. (10 points)

7. A 100 μF capacitance is initially charged to 1000 V. At t=0 it is connected to a 1-kΩ resistance. At what time t_2 has 50 percent of the initial energy stored in the capacitance been dissipated in the resistance? (10 points)

8. Derive an expression for $v_c(t)$ in the circuit below and sketch $v_c(t)$ to scale versus time. (Note that switch was closed before t=0 and becomes an open after t=0) (15 points)



9. Determine the maximum value of I_L (10 points)



10. The circuit shown in Figure has been set up for a long time prior to t=0 with the switch closed. Find the value of v_C prior to t=0. Find the steady-state value of v_C after the switch has been opened for a long time. (15 points)