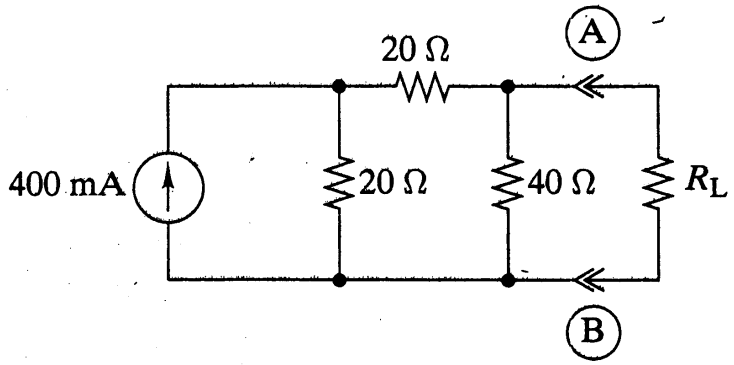
CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

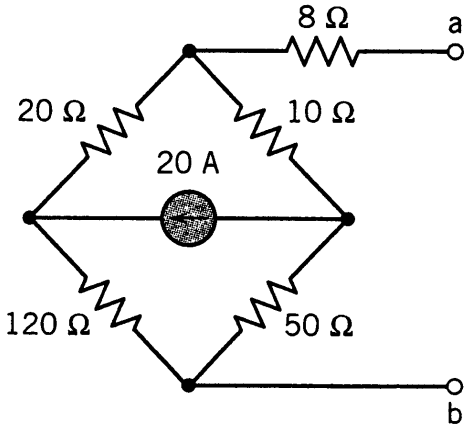
Homework Set No. 6 Issued 2/16/05
References: [T&R4] sections 3-5, 3-6, 4-1, 4-2 Due 2/23/05

MAXIMUM SIGNAL TRANSFER

1) (5 pts)
(a) The value of RL is adjusted such that RL dissipates the maximum power. What is the value of RL at which this occurs? What is the maximum power dissipated by RL?
(b) The value of RL is adjusted such that the voltage between A and B is a maximum. What is the value of RL at which this occurs? What is the maximum voltage between A and B?
(c) The value of RL is adjusted such that the current through RL is a maximum. What is the value of RL at which this occurs? What is the maximum current through RL?

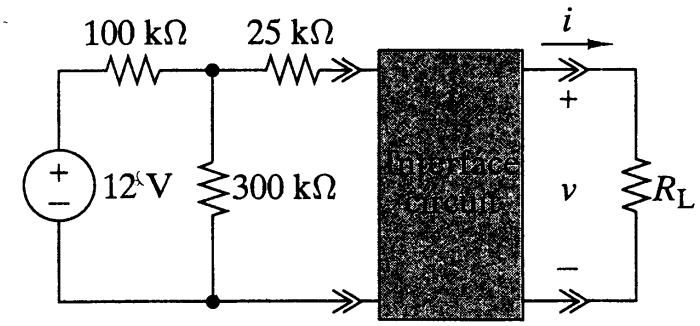


2) (5 pts) What is the maximum power that can be delivered to a resistor RL connected between a and b in the circuit below? What is the value of RL at which this occurs?



INTERFACE DESIGN

3) (5 pts) The black box in the circuit below represents an interface circuit which you will design. Possible interface circuits are listed in Figure 3-52 of our textbook. Select a circuit from Figure 3-52 and specify the component values such that the power delivered to the load never exceeds 1 milliwatt.

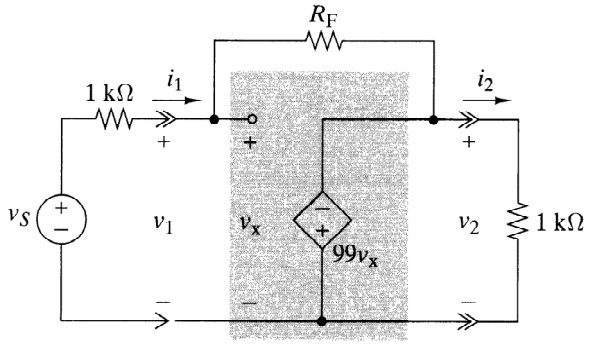


LINEAR DEPENDENT SOURCES

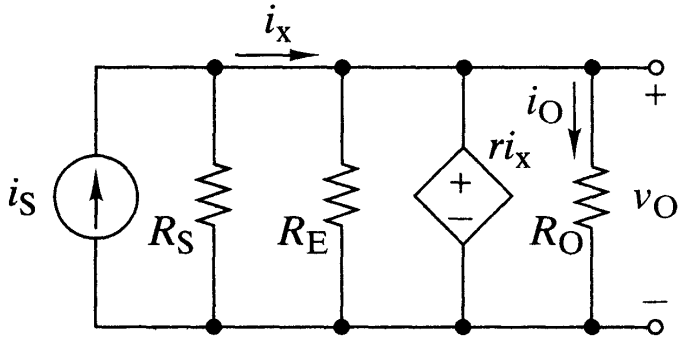
4) (5 pts) The circuit shown below is an ideal voltage amplifier.

(a) Find the output voltage v_2 and the current gain i_2/i_1 when v_s=10mV and R_F=10kΩ.

(b) Find the input resistance $R_{IN}=v_1/i_1$.



5) (5 pts) Find an expression for the current gain i_o/i_s in the circuit below.



COMPARISON OF ANALYSIS METHODS

6) (5 pts) Determine the node voltage vc and the current ix in the circuit shown below using
(a) mesh analysis and
(b) node analysis.