Electrical Engineering 40/40I/41I

Midterm 1 - Fall 1995

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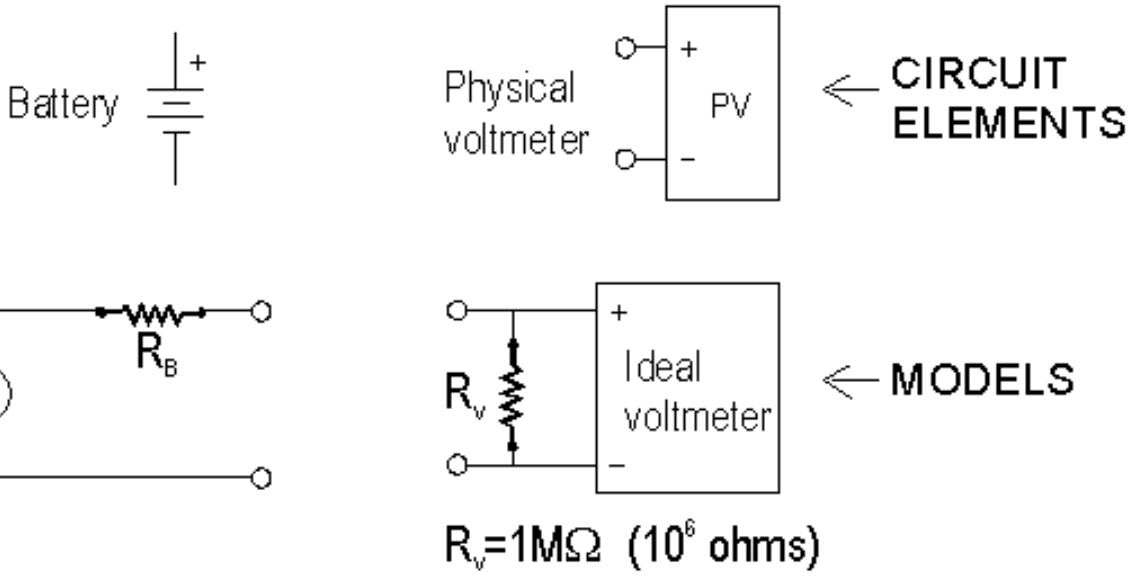
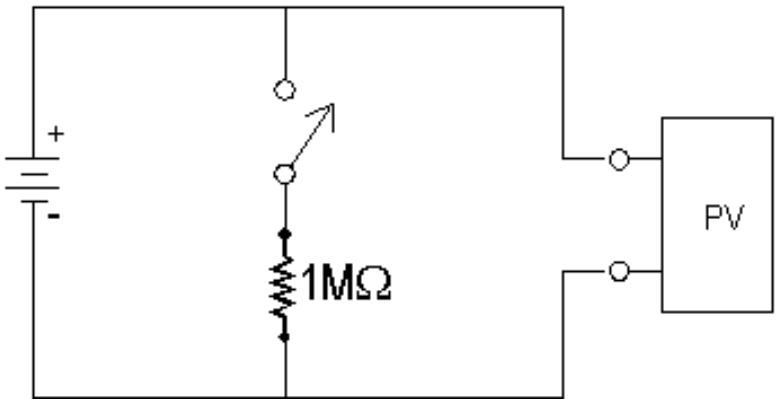
Problem 1: [25%]

Circuit models for a battery and a physical voltmeter are shown below:



A circuit is constructed as shown below:



When the switch is open (not connected) the physical voltmeter reads 8 volts. When the switch is closed (connected) the physical voltmeter reads 6 volts. Rind RB and VB.

R_B = _____ohms
V_B = _____volts

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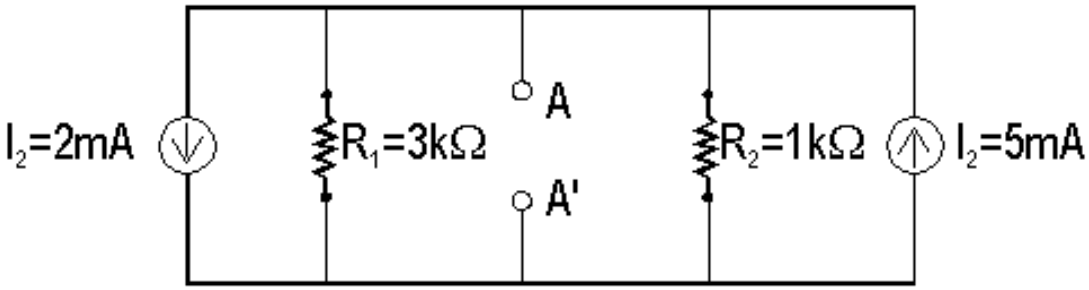
Problem 2: [25%]



A two-terminal subcircuit is shown with terminals A and A'. Find its Thé venin equivalent, making your method clear. (Label the terminals AA' in your equivalent circuit)

R_{TH} = _____ohms
V_{TH} = _____volts

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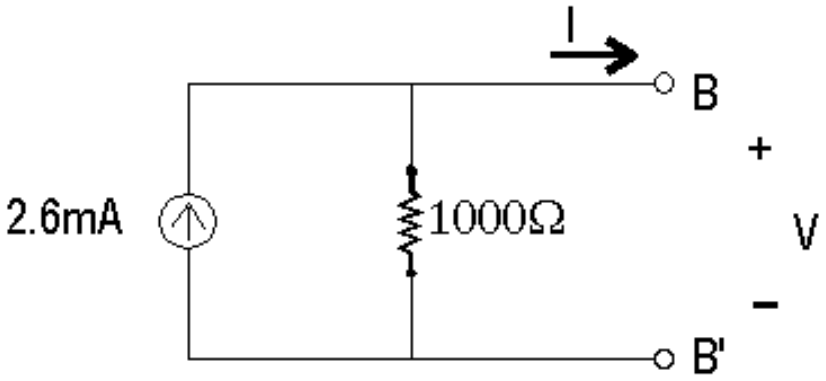
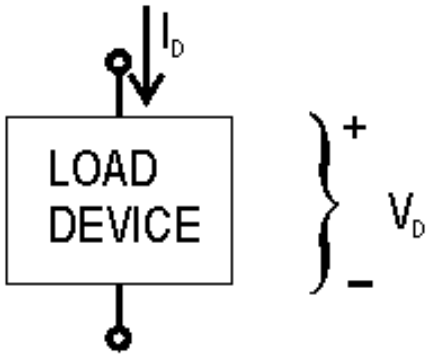
Problem 3: [25%]

(a) Plot the I-V characteristic of the Norton equivalent circuit having terminals B-B' on the axes below:

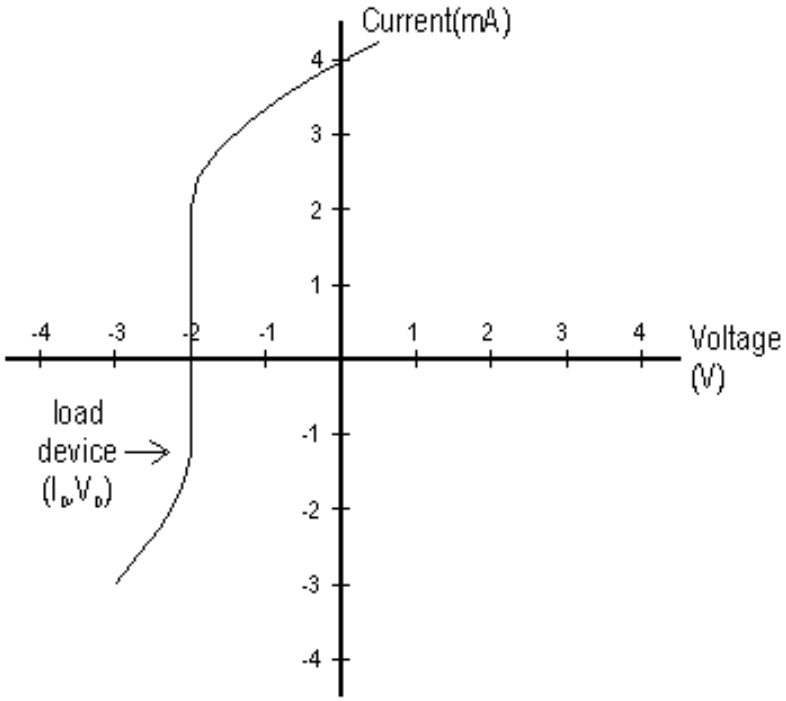




(b) The I-V characteristic of a load device is also plotted on these azes. If the load device is connected to terminals B-B',what current, ID, flows and what voltage, VD, appears across the load device?

I_D = _____mA
V_D = _____V

(c) Under the conditions of part (b), find the power delivered to the load device.



$P_{\text{delivered to load device}}$ = _____W

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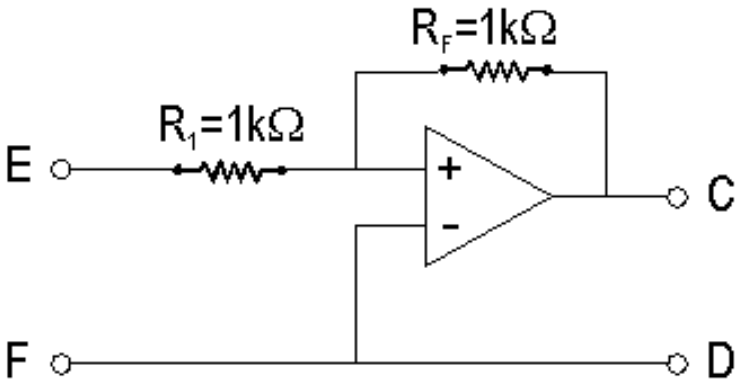
Problem 4: [25%]



In the above circuit the op-amp has an abnormally low voltage amplification; in fact, A=5. Its input resistance R_i=1MΩ and R_O=0. Output terminals C, D, are open-circuited.

(a) Re-draw the circuit with the full op-amp equivalent circuit inserted. (Do NOT use the ideal op-amp technique.)

(b) Find the input reisistance looking into terminals E, F. Use the full op-amp model. (Do NOT use the ideal op-amp technique.) Output terminals C, D are open-circuited.

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