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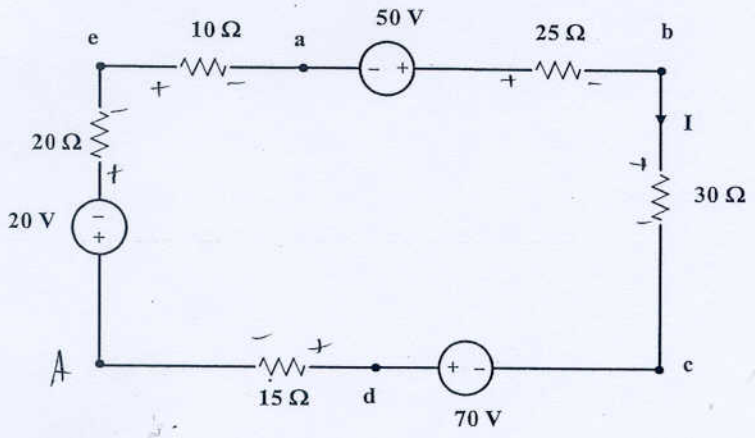
ECE 300
Spring Semester, 2007
Test #1

wlg Test B

Name green
Print (last, first)

Work the exam on your own engineering paper. Work on one side of your paper only. Attach your work to the back of this exam sheet and staple in the top left hand corner. Each problem 20%.

(1) You are given the circuit of Figure 1.
(a) Find I as indicated on the diagram.
(b) Find V_{ed}.
(c) Find the ***power absorbed by*** the 20 Ω resistor.
(d) Find the ***power supplied by*** the 20 V source.



(a) start at A, go CW, use Σ drops $= 0$

$$20 + 20I + 10I - 50 + 25I + 30I - 70 + 15I = 0$$

$$100I = 100$$

$$I = 1\ A$$

(b) $$-V_{ed} - 20I - 20 - 15I = 0$$

$$V_{ed} = -20 - 35I$$

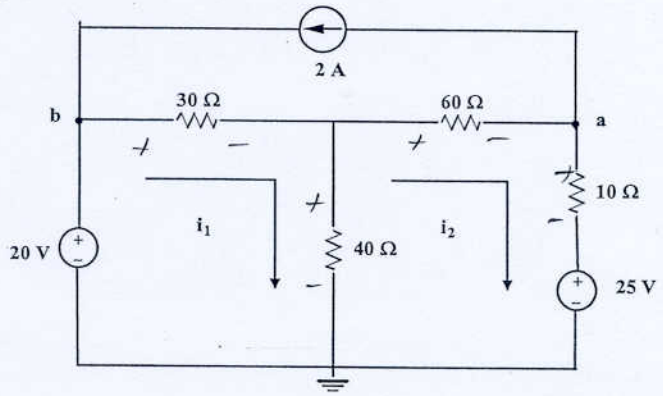
$$V_{ed} = -55\ V$$

(c) $$P_{20\Omega} = I^2 20 = (1)^2 20 = 20\ W$$

(d) $$P_{20\ source} = -20I = -20\ W$$

Figure 1: Circuit for problem 1.

(2) You are given the circuit in Figure 2.
(a) Use mesh analysis to find i_1 and i_2.
(b) Find V_{ab}.



(a)

mesh #1 $-20 + 30(i_1+2) + 40(i_1 - i_2) = 0$

$70 i_1 - 40 i_2 = -40$

mesh #2 $-40(i_1 - i_2) + 60(i_2+2) + 10 i_2 + 25 = 0$

$-40 i_1 + 110 i_2 = -145$

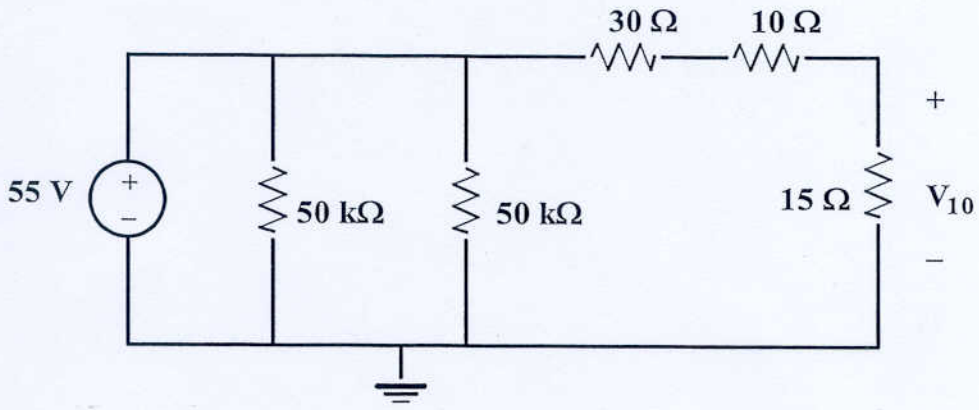
$i_1 = -1.67\ A$ $\quad i_2 = -1.93\ A$

(b) $-V_{ab} + 10 i_2 + 25 - 20 = 0$

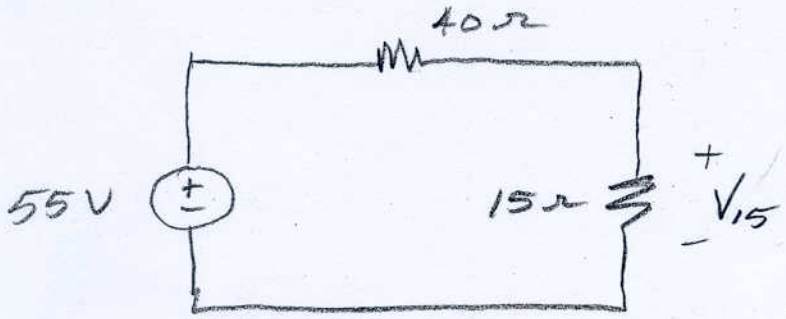
$V_{ab} = 5 + 10 i_2 = 5 + 10(-1.93)$

$V_{ab} = -14.3\ V$

(3) You are given the circuit of Figure 3. Find V_{10}.



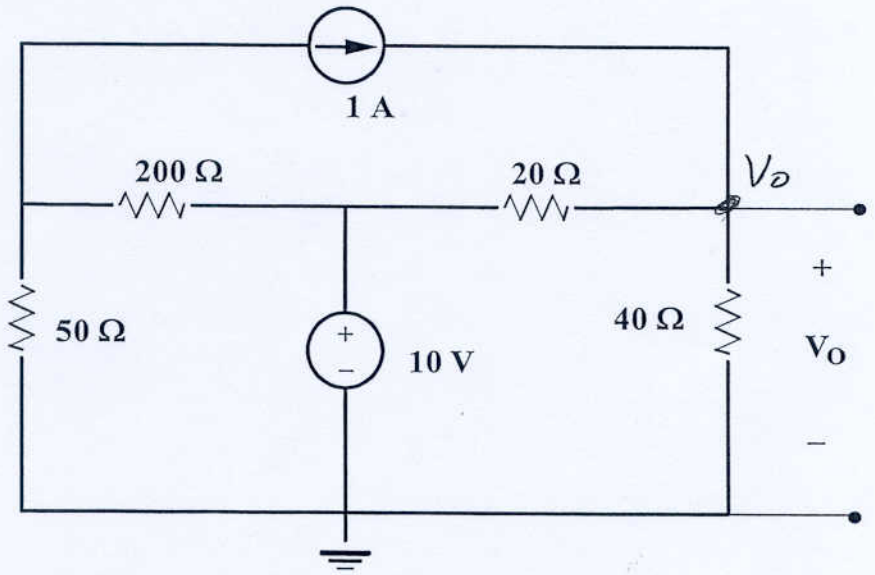
The circuit reduces to:



$$V_{15} = \frac{55 \times 15}{40 + 15} = 15\,V$$

$$\boxed{V_{15} = 15\,V}$$

(4) Use nodal analysis to find V_o in the circuit of Figure 4.



At V_o

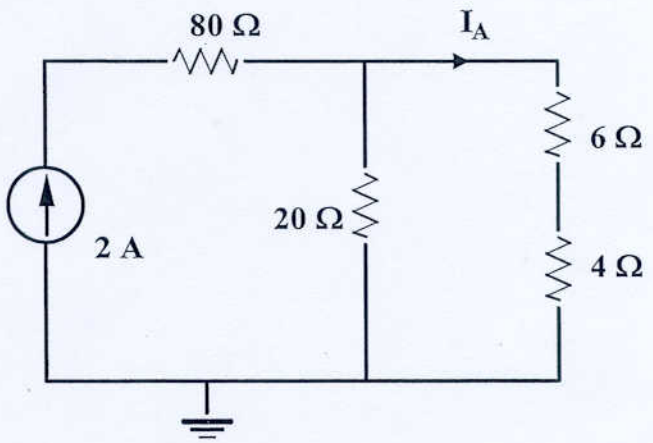
$$\frac{V_o - 10}{20} + \frac{V_o}{40} - 1 = 0$$

$$2V_o - 20 + V_o - 40 = 0$$

$$3V_o = 60$$

$$V_o = 20\,V$$

(5) You are given the circuit of Figure 5. Find the current I_A.



use current division

$$I_A = \frac{2 \times 20}{20 + 6 + 4}$$

$$I_A = \frac{40}{30}$$

$$I_A = 1.333 \text{ A}$$