ECE 201 – Fall 2008
Exam #1

September 22, 2008

Division 0101: Clark (7:30am)
Division 0201: Elliott (10:30 pm)
Division 0301: Capano (3:30 pm)
Division 0401: Qi (4:30 pm)

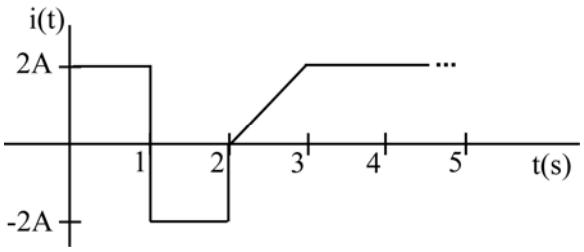
Instructions

1. DO NOT START UNTIL TOLD TO DO SO.
2. Write your Name, division, professor, and student ID# (PUID) on your scantron sheet.
3. This is a CLOSED BOOKS and CLOSED NOTES exam.
4. There is only one correct answer to each question.
5. Calculators are allowed (but not necessary).
6. If extra paper is needed, use back of test pages.
7. Cheating will not be tolerated. Cheating in this exam will result in an F in the course.
8. If you cannot solve a question, be sure to look at the other ones and come back to it if time permits.
9. As described in the course syllabus, we must certify that every student who receives a passing grade in this course has satisfied each of the course outcomes. On this exam, you have the opportunity to satisfy outcomes i, ii, and iii. (See the course syllabus for a complete description of each outcome.) On the chart below, we list the criteria we use for determining whether you have satisfied these course outcomes.

Course Outcome	Exam Questions	Total Points Possible	Minimum Points required to satisfy course outcome
i	1-6, 11-14	70	35
ii	7-10	28	14

If you fail to satisfy any of the course outcomes, don't panic. There will be more opportunities for you to do so.

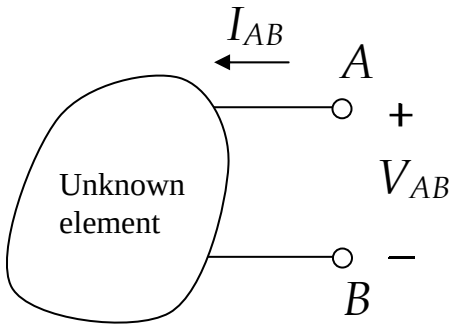
1. The current i(t) through an element is shown in the plot. Determine the total charge that has passed through this element in the interval between t = 0 and t = 4s.



(1) 0 C (2) +1 C (3) -1 C (4) +2 C

(5) -2 C (6) +3 C (7) -3 C

2. Consider a circuit element shown below with two nodes A and B. When a series of voltages V_{AB} are applied, the current I_{AB} is listed in the following table. What could this element be?

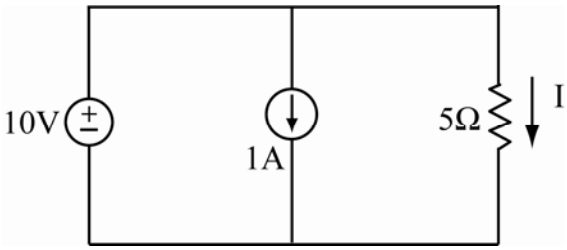


Applied voltage, V_{AB}	Measured current, I_{AB}
2 V	1 A
0 V	1 A
–2 V	1 A

(1) 2V voltage source (2) 2Ω resistor (3) – 2 Ω resistor

(4) 1A current source (5) None of the above

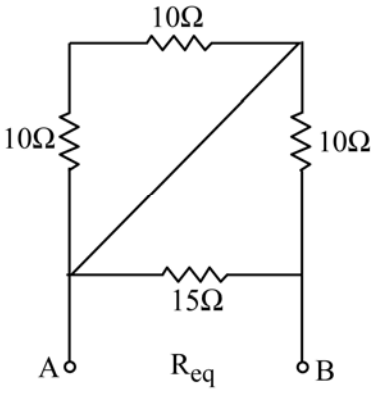
3. The current flow through the 5Ω resistor, I, and the power absorbed by the 1A current source, P, are:



(1) I = 2A, P = 10 W (2) I = 2A, P = -10 W (3) I = 1A, P = 10 W

(4) I = 1A, P = -10 W (5) I = -1A, P = 10 W (6) I = -1A, P = -10 W

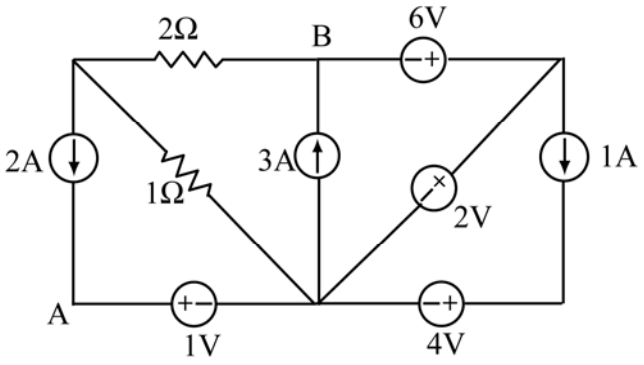
4. The equivalent resistance between nodes A & B, R_{eq}, is:



(1) 5Ω (2) 6Ω (3) 10Ω (4) 15Ω

(5) 25Ω (6) 30Ω (7) 45Ω

5. The voltage drop from node A to node B is:

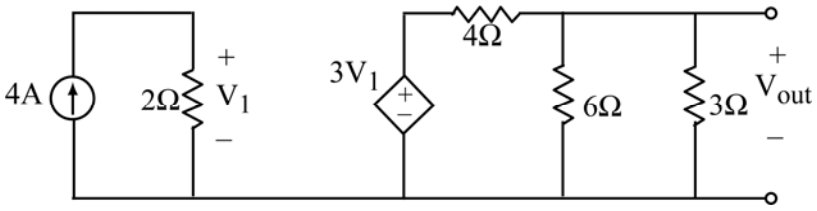


(1) 1V (2) 2V (3) 3V (4) 4V

(5) 5V (6) 6V (7) 7V (8) 8V

(9) 9V (10) 10V

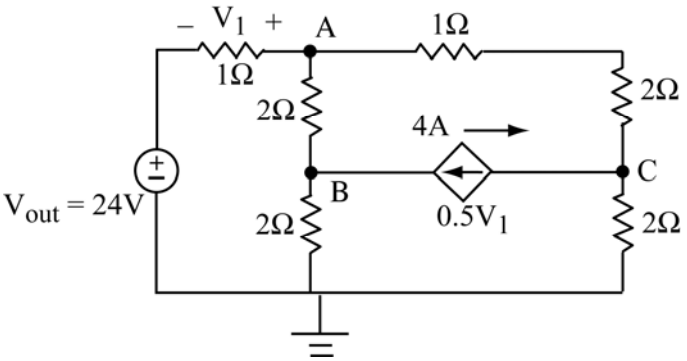
6. Find the output voltage, V_{out}, for the circuit below (in V):



(1) cannot be determined (2) 2 (3) 3 (4) 4

(5) 8 (6) 10 (7) 12

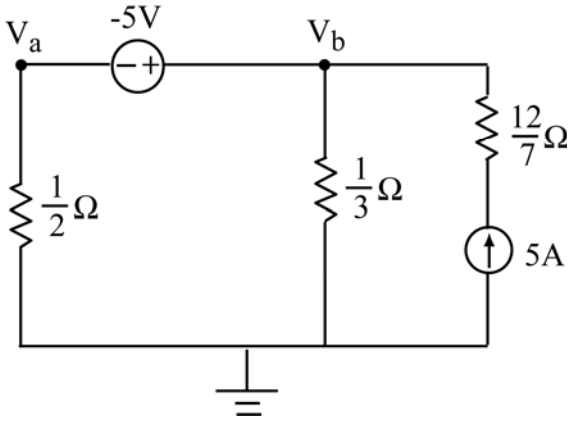
7. In the circuit below, find nodal voltage V_B when nodal voltage V_A equals 16 V.



(1) 1V (2) 2V (3) 3V (4) 4V

(5) 8V (6) 12V (7) 16V

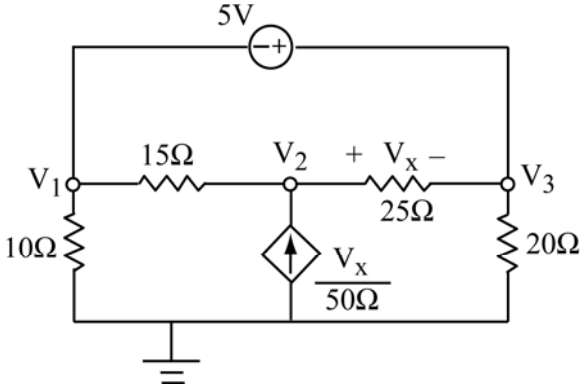
8. The following circuit consists of a floating voltage source and a current source. Determine the node voltage V_a.



(1) $V_a = 0V$ (2) $V_a = 1V$ (3) $V_a = -2V$ (4) $V_a = 4V$

(5) $V_a = 3V$ (6) $V_a = 5V$ (7) $V_a = -6V$ (8) $V_a = 7V$

9. For the circuit shown with nodal voltages V_1, V_2 and V_3, as labeled, which of the following equations is correct? (The node at which each equation might be derived is given in parentheses.)



(1) $\frac{V_1}{10\Omega}+\frac{V_1-V_2}{15\Omega}-5V=0$ (node 1)

(2) $\frac{V_1}{10\Omega}+\frac{V_1-V_3}{40\Omega}+\frac{5V}{10\Omega}=0$ (node 1)

(3) $\frac{V_1}{10\Omega}+\frac{V_1-V_2}{15\Omega}-\frac{5V}{10\Omega}=0$ (node 1)

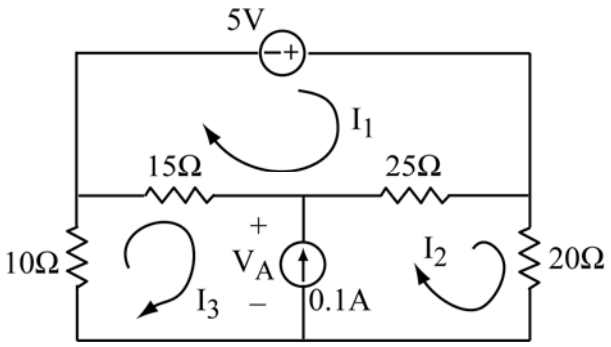
(4) $\frac{V_2-V_1}{15\Omega}+\frac{V_2}{50\Omega}+\frac{V_2-V_3}{25\Omega}=0$ (node 2)

(5) $\frac{V_2-V_1}{15\Omega}+\frac{V_2-V_3}{25\Omega}=0$ (node 2)

(6) $\frac{V_2-V_1}{15\Omega}-\frac{V_x}{50\Omega}+\frac{V_2-V_3}{25\Omega}=0$ (node 2)

(7) $\frac{V_3}{20\Omega}+\frac{V_3-V_2}{25\Omega}+\frac{V_1}{10\Omega}=0$ (node 3 + 1)

10. For the circuit shown, with mesh currents I_1, I_2, and I_3, as labeled, which one of the following equations is correct? (The mesh at which each equation might be derived is given in parentheses.)



(1) $5\text{V}\ \ I_1+(I_1-I_2)25\Omega+(I_1-I_3)15\Omega=0$ (mesh 1)

(2) $-5\text{V}\ \ I_1+(I_1-I_2)25\Omega+(I_1-I_3)15\Omega=0$ (mesh 1)

(3) $(I_2-I_1)25\Omega-I_2 20\Omega-0.1\text{A}=0$ (mesh 2)

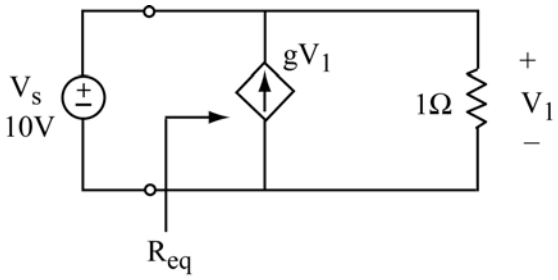
(4) $(I_2-I_1)25\Omega-I_2 20\Omega+0.1\text{A}=0$ (mesh 2)

(5) $(I_2-I_1)25\Omega-I_2(20\Omega)=0$ (mesh 2)

(6) $(I_2-I_1)25\Omega-I_2(20\Omega)-V_\text{A}=0$ (mesh 2)

(7) $(I_2-I_1)25\Omega+I_2(20\Omega)-V_\text{A}=0$ (mesh 2)

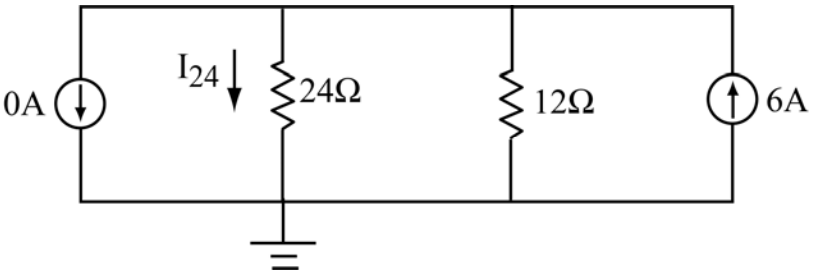
11. The constant g in the circuit below is 1/5 S. Determine the equivalent resistance R_{eq} of the dependent source – resistor combination in the circuit below.



(1) 1.25Ω (2) 8Ω (3) 1Ω (4) 10Ω

(5) 0.5Ω (6) 2Ω (7) 0.67Ω

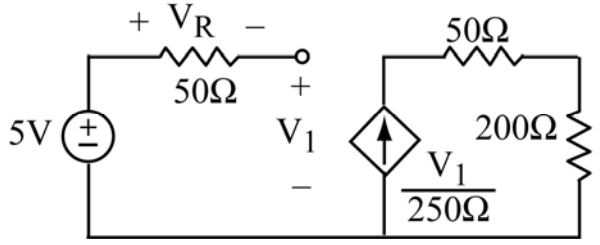
12. Find the current that flows through the 24 ohm resistor I_{24} (in A):



(1) 0 (2) 12/5 (3) 2 (4) 4

(5) 5/2 (6) 6/5 (7) 5

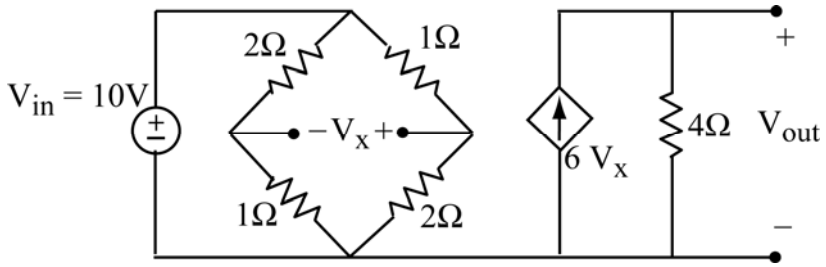
13. In the circuit shown, determine V_R.



(1) 5V (2) -5V (3) 4V (4) -4V

(5) 1V (6) -1V (7) 0V

14. In the following circuit, the current of the VCCS (Voltage Controlled Current Source) depends on the voltage V_x across the "diamond-shaped" Wheatstone Bridge. The transconductance of the VCCS is 6S . What is the gain V_{out}/V_{in} of this amplifier?



(1) $V_{out}/V_{in}=1$ (2) $V_{out}/V_{in}=2$ (3) $V_{out}/V_{in}=3$

(4) $V_{out}/V_{in}=4$ (5) $V_{out}/V_{in}=5$ (6) $V_{out}/V_{in}=6$

(7) $V_{out}/V_{in}=7$ (8) $V_{out}/V_{in}=8$