College of Industrial Technology

King Mongkut's University of Technology North Bangkok

เลขที่นั่งสอบ

Final Examination of Semester 1 Year: 2018

Subject: 341151 Electric Circuits I Section: 05-06

Date: 6 December 2018 Time: 10.00-12.00

Name:_____ ID:_____ Field of Study:_____

Instructions:

1. The examination has 11 pages (including this page), 3 sections (35 questions) and a total score of 60 points.
2. Write all your solutions and answers on this examination sheet.
3. This is a closed book examination.
4. You are not allowed to leave the exam room during the first 1 hour after the beginning of the exam.
5. You are not allowed to open the exam papers or start to answer before the proctor's permission.
6. You are not allowed to use the restroom during the exam except in case of an emergency.
7. No documents are allowed to be taken out of the examination room.
8. Calculator is allowed in the examination.
9. Electronic communication devices are NOT allowed in the examination room.
10. Cheating will result in failure of all classes registered for the current semester. Students who are caught cheating will also be denied registering for the following semester.

Cheating in the exam is considered an extremely serious offence which will result in expulsion from the University

Part 1 (10 points) True/False

Instruction: Mark "True" or "False" for the following questions in **THE PROVIDED ANSWER SHEET (SEE LAST PAGE).**

1. When using the superposition theorem, each ideal voltage must be replaced by an open circuit.
2. Thevenin's theorem permits the reduction of any two-terminal linear dc network to one having a single voltage source and series resistance.
3. For any physical network, the value of E_{Th} can be determined experimentally by measuring the open-circuit voltage across the load terminals.
4. The total inductance for inductors in series and parallel can be found the same way as resistors in series and parallel.
5. All practical sources have some internal resistance.
6. For loads connected directly to a dc-voltage supply, maximum power will be delivered to the load when the Thévenin resistance is equal to the internal resistance of the source.
7. Source conversions are equivalent at their internal terminals.
8. R_N is different from R_{Th}.
9. An ideal inductor looks like an open circuit to dc current.
10. Short circuit between terminals is equivalent to zero voltage.

Part 2 (20 points) Multiple choices

Instruction: Mark the correct answer for the following questions in **THE PROVIDED ANSWER SHEET.**

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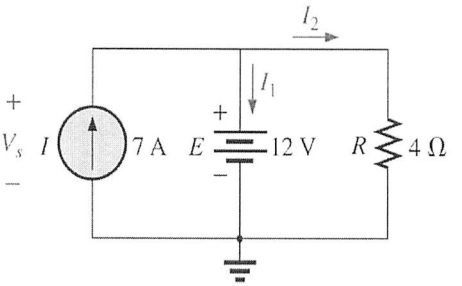
1. Find the voltage Vs and current I2 for the network in figure below.



(A) 12 V and 3 A (B) 3 V and 12 A (C) 12 V and 4 A (D) 4 V and 3 A

2. Convert the current source to a voltage source.

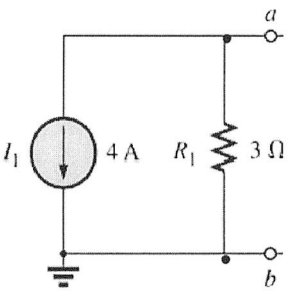


Figure 1.

(A) 12 V and 3 Ω (B) 4 V and 3 Ω (C) 12 V and 4/3 Ω (D) 4 V and 4/3 Ω

3. What is the determinant of this matrix?

$$\begin{bmatrix} 2 & -4 \\ 5 & 1 \end{bmatrix}$$

(A) 22 (B) -18 (C) -40 (D) 20

4. What is the determinant of this matrix?

$$\begin{bmatrix} 1 & 4 & 1 \\ 1 & 2 & 1 \\ 2 & 3 & 1 \end{bmatrix}$$

(A) 2 (B) -10 (C) -2 (D) 10

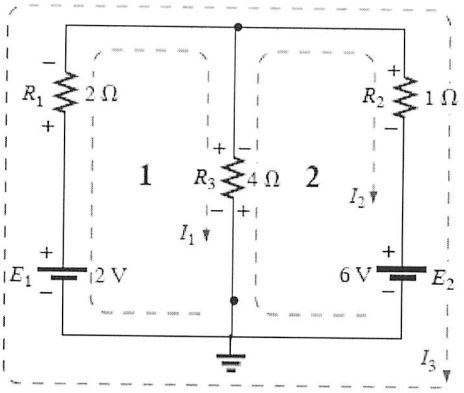


Figure 2.

5. See Figure 2. At mesh #1, which of the following terms describes the voltage across the 4 Ω resistor when using the mesh analysis?

   (A) $(4\ \Omega)(I_2 + I_1)$ (B) $(4\ \Omega)(I_2 - I_1)$ (C) $(4\ \Omega)(I_1 + I_2)$ (D) $(4\ \Omega)(I_1 - I_2)$

6. See Figure 2. The equation obtained from performing mesh analysis on mesh #2 is:

   (A) $6 - I_2 - 4(I_2 - I_1)=0$ (B) $6 + I_2 + 4(I_2 - I_1)=0$

   (C) $6 + I_2 - 4(I_2 - I_1)=0$ (D) $6 - I_2 + 4(I_2 - I_1)=0$

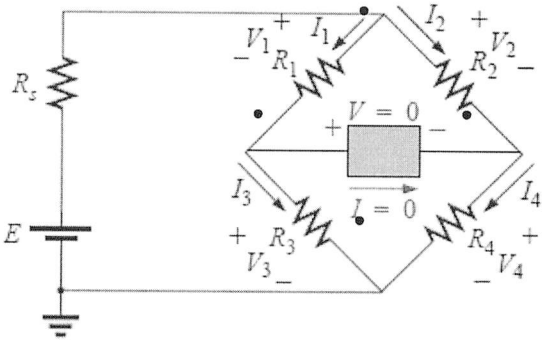


Figure 3.

7. From Figure 3, what is the condition of balance bridge ?

   (A) $R_2 / R_1 = R_3 / R_4$ (B) $R_1 R_2 = R_3 R_4$ (C) $R_1 / R_3 = R_2 / R_4$ (D) $R_1 R_3 = R_2 R_4$

8. What the following is correct when all three resistors in delta network are equal?

   (A) $R_\Delta = 3R_Y$ (B) $R_\Delta = 3/R_Y$ (C) $R_\Delta = R_Y$ (D) $R_\Delta = 1/R_Y$

9. E_{th} is the _____ voltage at the two-terminal network.

(A) short circuit (B) load (C) fully loaded (D) open circuit

10. Thevenin's theorem states that you can replace a DC network with an equivalent circuit consisting of_____.

(A) a voltage source and a series resistor.

(B) a current source and a series resistor.

(C) a current source and a parallel resistor.

(D) a voltage source and a parallel resistor.

11. Norton's theorem states that the Norton current is equal to_____.

(A) open circuit voltage at the network terminals.

(B) short circuit voltage at the network terminals.

(C) open circuit current at the network terminals.

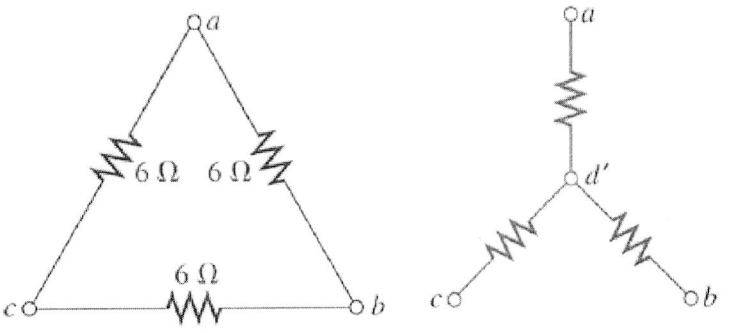
(D) short circuit current at the network terminals.

12. For loads connected directly to a dc-voltage supply, maximum power will be delivered to the load when the _____is equal to the internal resistance of the source.

(A) total resistance (B) Norton resistance

(C) load resistance (D) Thévenin resistance

13. What are the values of resistors after converting the delta to star ?



(A) all in 1 Ω (B) all in 2 Ω (C) all in 3 Ω (D) all in 6 Ω

14. What is the result of x from following two equations?

$$-x+2y=3$$
$$3x-2y=-2$$

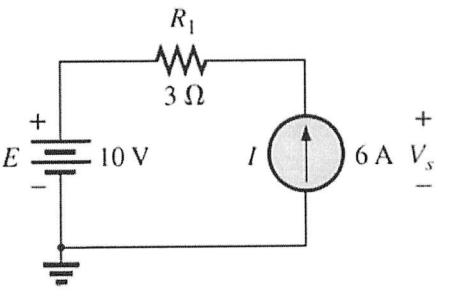
(A) −2 (B) 0.5 (C) 1 (D) 2

15. What is the value of I_2 ?

$$I_2=\frac{\begin{vmatrix}6 & 2\\ 4 & 6\end{vmatrix}}{14}$$

(A) 0 A (B) 0.5 A (C) 1 A (D) 2 A

16. Find the value of voltage V_s from the figure below.



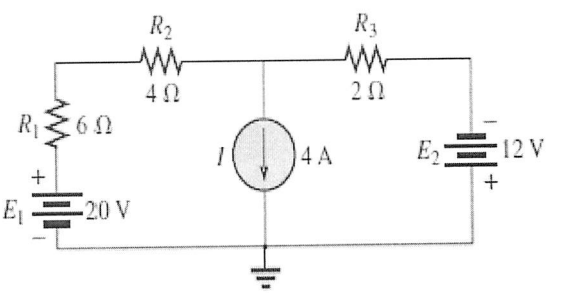
(A) 0 V (B) 8 V (C) 18 V (D) 28 V

17. Given linear system of equation below, what is the current I1 and I3?

$$15-4I_1+10I_3-20=0$$
$$20-10I_3-5(I_1+I_3)+40=0$$

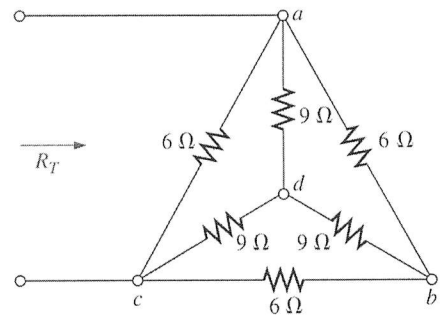
(A) 4.77A, 2.41A (B) 4.0A, 2.0A (C) 5.77A, 3.41A (D) 6.7A, 2.0A

18. Find current IR1 of circuit below.



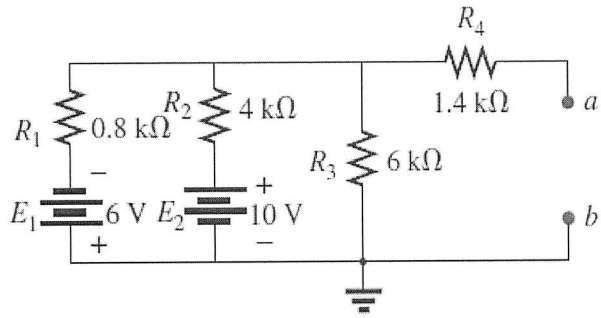
(A) 3.33A (B) 4.0A, (C) 5.77A (D) -2.0A

19. Find the total resistance RT of the figure below.



(A) 3.27 Ω (B) 6.7 Ω (C) 4 Ω (D) 6 Ω

20. Find the RTH of the figure below.



(A) 2 kΩ (B) 6.7 kΩ (C) 3 kΩ (D) 3.5 kΩ

Part 3 (30 points) Calculation

Instruction: Show the mathematical expression and answers of following problems.

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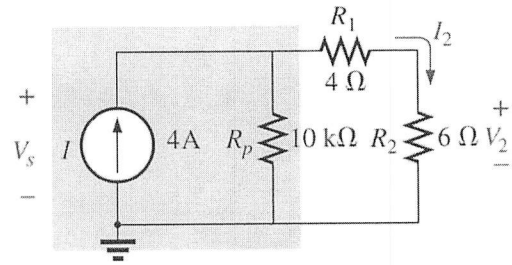
1. (5 points) For the network in below,

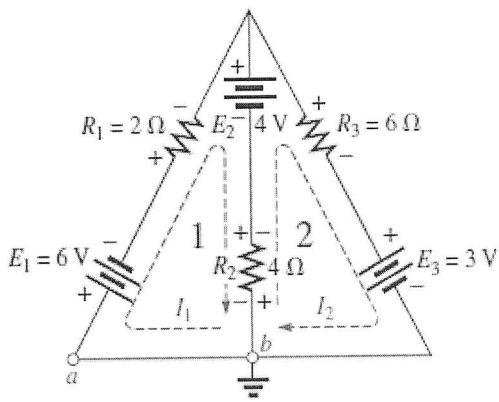
   1.1 Find current I_2

   1.2 Calculate voltage V_2

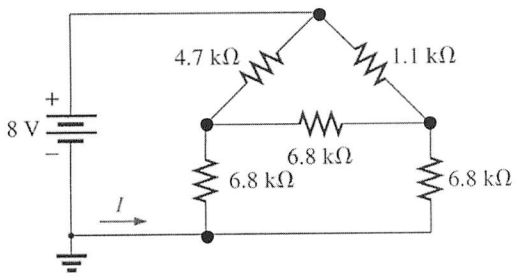
   1.3 Find the source voltage V_s



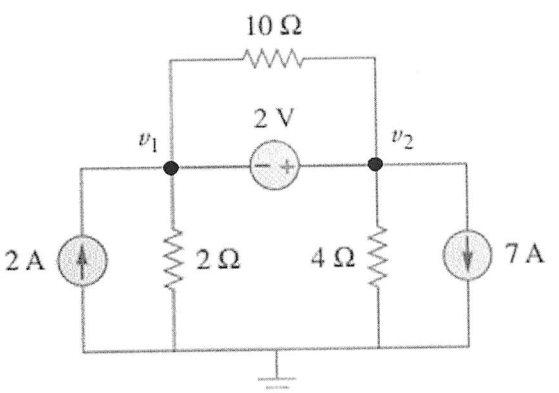
2. (10 points) Determine the current I_1, and I_2 by using mesh analysis method.



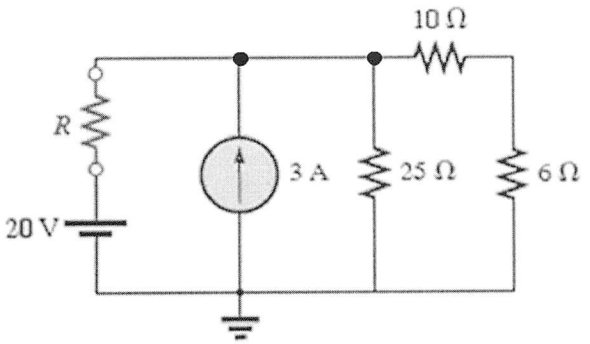
3. (5 points) Convert the Δ of 6.8 kΩ resistors in network below to a Y configuration and find the current I.



4. (5 points) Determine the voltage of R=10Ω, R=4Ω and R=2Ω by using super node analysis method.



5. (5 points) Find the Thevenin equivalent circuit at resistance R and current at R. Given R=1Ω.



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Answer Sheet

Name:_____ ID:_____

เลขที่นั่งสอบ

Subject: 341151 Electric Circuits I

Part 1

	True	False
1.		
2.		
3.		
4.		
5.		
6.		
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8.		
9.		
10.		

Part 2

	A	B	C	D
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