College of Industrial Technology

King Mongkut's University of Technology North Bangkok

เลขที่นั่งสอบ

Final Examination of Semester 1 **Year:** 2014

Subject: 341151 Electric Circuits I **Section:** 5 - 6

Date: 17 December 2014 **Time:** 10.00-12.00

Name:_____ ID:_____ Class:_____

Instructions:

1. Cheating will result in failure of all classes registered for the current semester. Students who are caught on cheating will also be denied registering for the following semester.
2. No documents are allowed to be taken out of the examination room.
3. Text books and dictionaries are **NOT** allowed.
4. A calculator is allowed.
5. Electronic communication devices are **NOT** allowed in the examination room.
6. The examination has 9 pages, 3 parts (49 questions) and a total score of 90 points.
7. Write all your answers on this examination sheet.

Part 1 (20 points) True/False

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

1. An ideal voltage source has infinite internal resistance.
2. An ideal current source has zero resistance in series with it.
3. Short circuit between terminals is equivalent to zero current.
4. Voltage sources cannot be placed in parallel if they are not the same polarity.
5. The current supplied by an ideal current source is independent on the load.
6. Additional equation from KVL is needed in super mesh circuit.
7. For nodal analysis, Kirchhoff's voltage law is used.
8. Variables in mesh analysis in the form of voltage.
9. Super node is happened if there is current source in branch.
10. When using the superposition theorem, each ideal voltage source must be replaced by an open circuit.
11. Thevenin's theorem permits the reduction of any two-terminal linear dc network to one having a single voltage source and parallel resistance.
12. For any physical network, the value of I_N can be determined experimentally by measuring the short-circuit current across the load terminals.
13. R_N from Norton theorem is not the same as R_{Th} from Thevenin theorem.
14. A load will receive the maximum power from a linear bilateral dc network when its total resistive value is exactly equal to the Norton resistance of the network as "seen" by the load.
15. Capacitance is directly proportional to the distancebetween the plates and inversely proportional to the areaof the plates.
16. The total capacitance of several capacitors connected in parallel equals the sum of the individual capacitances.
17. An ideal inductor looks like anopen circuit to dc current.
18. The total inductance of several coils in parallel equals the sum of the individual inductances.
19. Michael Faraday discovered the interaction between electric and magnetic effects.
20. The unit of capacitance is named after Michael Faraday.

Part 2 (50 points) Multiple choices

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

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1. Voltage sources may be placed in parallel if they are _____.
   (A) identical (B) different
   (C) the same in polarity (D) different in polarity

2. An ideal current source has _____ source resistance.
   (A) infinity (B) zero (C) small (D) large

3. Convert the current source to a voltage source.

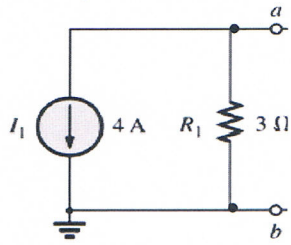


Figure 1.

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

4. From below, what is the determinant?

$$\begin{vmatrix} 2 & 2 \\ 3 & 4 \end{vmatrix}$$

   (A) 0 (B) 1 (C) 2 (D) 14

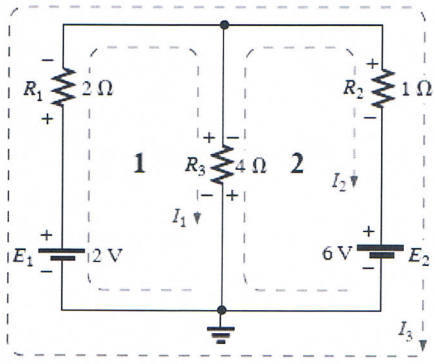


Figure 2.

5. See Figure 2. Which of the following terms describes the voltage across the 4Ωresistor when using the mesh analysis (general) approach?
   (A) $(4\ \Omega)I_1$ (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. Which statement is true if the loop current I_2 is found to be a negative number?

   (A) The nodal analysis approach should have been used, not the mesh analysis approach.

   (B) The determinant used to compute the current is equal to zero.

   (C) The 6 V battery and 1 Ω resistor should have been converted to a current source.

   (D) The original direction assumed for I_2 is wrong.

7. See Figure 2. The equation obtained from performing mesh analysis on mesh #1 is:

   (A) $2V - 2I_1 - 4(I_1 - I_2)=0$ (B) $2V+2I_1+4(I_1 - I_2)=0$

   (C) $2V+2I_1 - 4(I_1 - I_2)=0$ (D) $2V - 2I_1 + 4(I_1 - I_2)=0$

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

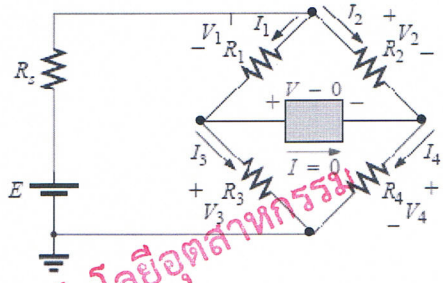


Figure 3.

   (A) $R_2/R_1 = R_3/R_4$ (B) $R_1R_2 = R_3R_4$ (C) $R_1/R_3 = R_2/R_4$ (D) $R_1R_3 = R_2R_4$

9. What the following is correct when all three resistors in star network are equal?

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

10. I_N is the _____ current passing through the two-terminal network.

    (A) short circuit (B) load

    (C) fully loaded (D) open circuit

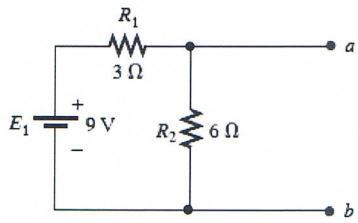


Figure 4.

11. See Figure 4. What is the Thevenin resistance at the terminal a-b?

    (A) 1 Ω (B) 2 Ω (C) 3 Ω (D) 9 Ω

12. See Figure 4. What is the Thevenin voltage at the terminals?
(A) 3 V (B) 6 V (C) 9 V (D) 12 V

13. Thevenin's theorem states that you can replace a bilateral 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.

14. Thevenin's theorem states that the Thevenin voltage 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.

15. 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) Thevenin resistance

16. The most obvious advantage of the superposition theorem is that _____ advanced mathematical techniques.
(A) it makes it harder to use (B) it makes it easier to use
(C) it does not require (D) it requires

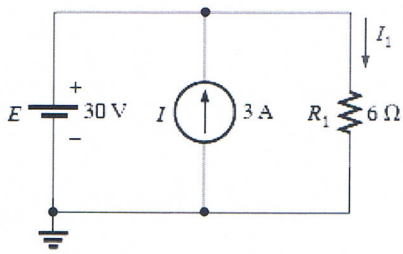


Figure 5.

17. See Figure 5.What is the current at R_1?
(A) 2 A (B) 3 A (C) 5 A (D) 8 A

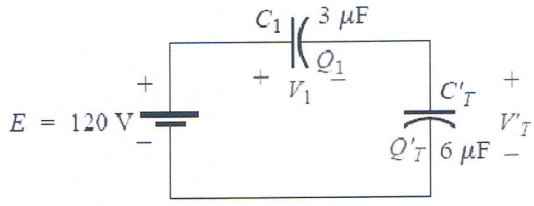
18. See Figure 5.What is the current from voltage source?
(A) 2 A (B) 3 A (C) 5 A (D) 8 A

19. A capacitor has a capacitance of 1 farad if 1 _____ of charge is deposited on the plates by a potential difference of 1 volt across the plates.

(A) particle (B) amp

(C) atom (D) coulomb

20. Find the total capacitance.



(A) 1 F (B) 2 F (C) 3 F (D) 9 F

21. What is correct for a given capacitor C?

(A) Q = CV (B) Q = C/V (C) Q = V/C (D) $Q = V^2/C$

22. What is the unit of inductor?

(A) Farad (B) Ohm (C) Henry (D) Watt

23. What is the unit of capacitor?

(A) Farad (B) Ohm (C) Henry (D) Watt

24. What is the symbol of air core inductor?


(A)


(B)


(C)


(D)

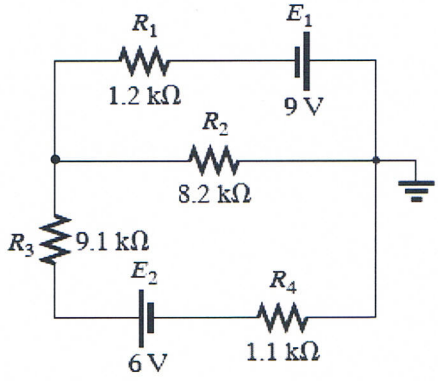
25. What is the unit of magnetic flux in SI unit?

(A) Farad (B) Hertz (C) Henry (D) Weber

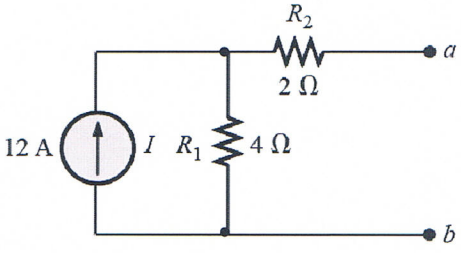
Part 3 (20 points) Calculation

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

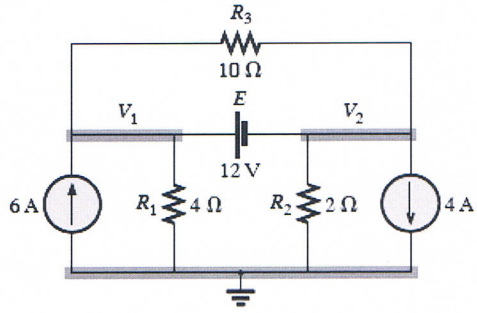
1. Using the mesh analysis approach, determine the electric current passing each resistor for the given network below.



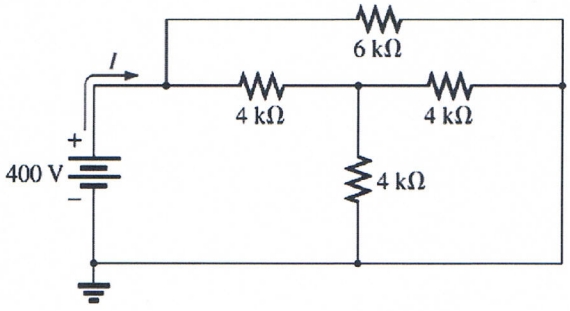
2. Find the Thevenin equivalent circuit for the network below.



3. Use supernode approach to determine the nodal voltages V_1 and $V_2$for the network below



4. Determine the electric current I by using star-delta transformation.



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Answer Sheet

Name:_____ ID:_____

Subject: 341151 ElectricCircuits I

Part 1

	True	False
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Part 2

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