

College of Industrial Technology
King Mongkut's University of Technology North Bangkok



Final Examination of Semester 1

Year: 2013

Subject: 341151 Electric Circuits I

Section: 5 - 6

Date: 3 October 2013

Time: 08.00-10.00

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 are NOT allowed.
4. Calculators are allowed.
5. Electronic communication devices are NOT allowed in the examination room.
6. The examination has 8 pages (including this page), 3 parts (50 questions) and a total score of 100 points.
7. Write all your solution and answer on this examination and answer sheet.

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Part 1 (20 points) True/False

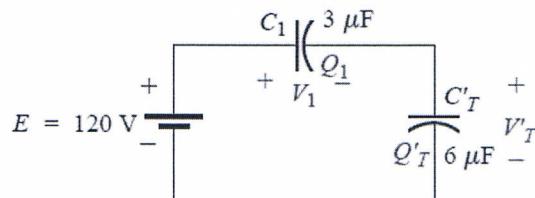
Instruction: Mark "True" or "False" for the following questions in **THE PROVIDED ANSWER SHEET**
(SEE LAST PAGE).

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

Part 2 (50 points) Multiple choices

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

1. Find the total capacitance.

(A) 1 μF (B) 2 μF (C) 3 μF (D) 9 μF

2. What is correct for a given capacitor C ?

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

3. 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

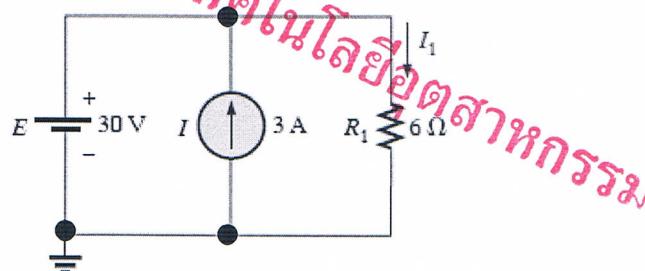


Figure 1.

4. See Figure 1. What is the current at R_1 ?

(A) 2 A

(B) 3 A

(C) 5 A

(D) 8 A

5. See Figure 1. What is the current from voltage source ?

(A) 2 A

(B) 3 A

(C) 5 A

(D) 8 A

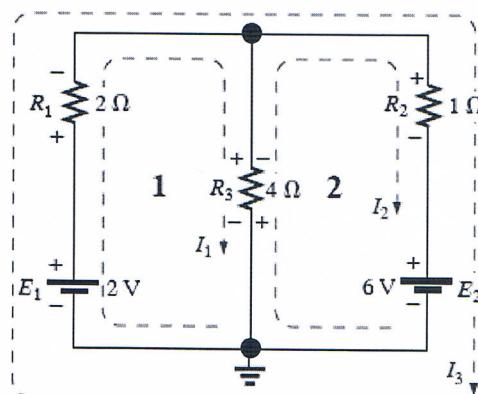


Figure 2.

6. See Figure 2. Which of the following terms describes the voltage across the 4Ω resistor when using the mesh analysis (general) approach?
- (A) $(4 \Omega)I_1$ (B) $(4 \Omega)I_2$
 (C) $(4 \Omega)(I_1 - I_2)$ (D) $(4 \Omega)(I_1 + I_2)$
7. 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 1Ω resistor should have been converted to a current source.
 (D) The original direction assumed for I_2 is wrong.
8. See Figure 2. If nodal analysis were to be used to solve for unknown voltages in this circuit, how many nodes would be needed (including the reference node)?
- (A) 1 (B) 2 (C) 3 (D) 4

9. 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) $2V - 2I_1 + 4(I_1 - I_2) = 0$

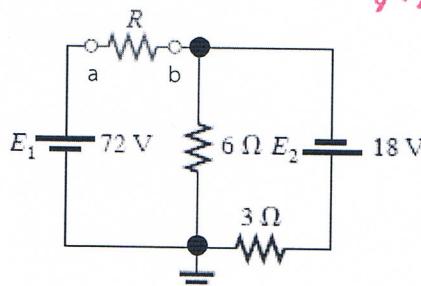
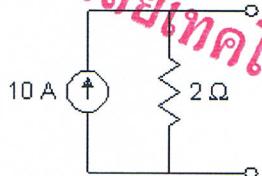


Figure 3.

10. See Figure 3. What is the Thevenin resistance at the terminal a-b (after moving R out)?
- (A) 1Ω (B) 2Ω (C) 3Ω (D) 9Ω
11. See Figure 3. What is the Thevenin voltage at the terminals ?
- (A) 90 V (B) 54 V (C) 60 V (D) 84 V
12. 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

13. 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
14. Current sources may be placed in series if they are _____.
 (A) identical (B) different
 (C) the same in polarity (D) different in polarity
15. An ideal current source has _____ source resistance.
 (A) infinity (B) zero
 (C) small (D) large
16. Convert the current source to a voltage source.
- 
- (A) 20 V and 20 Ω (B) 2 V and 2 Ω
 (C) 20 V and 2 Ω (D) 2 V and 20 Ω
17. The star (Δ) and the delta (Δ) configurations often appear in a circuit as _____.
 (A) opposites of each other (B) duals of each other
 (C) neither series nor parallel (D) both series and parallel
18. 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
19. E_{th} is the _____ voltage looking back into the two-terminal network.
 (A) short circuit (B) load
 (C) fully loaded (D) open circuit
20. 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

21. From equation below, what is the value of I_2 ?

$$6I_1 + 4I_2 = +2$$

$$4I_1 + 5I_2 = +6$$

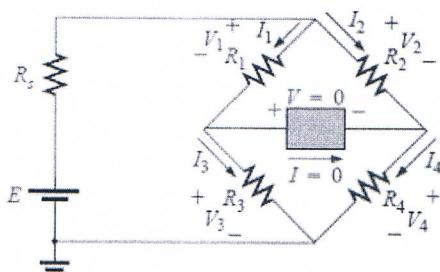
(A) 1 A

(B) 2 A

(C) -1 A

(D) -2 A

22. From figure below, what is the condition of balance bridge?



(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) $R_1R_3 = R_2R_4$

23. 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) $R_\Delta = 1/R_Y$

24. What is the unit of inductor?

(A) Farad

(B) Ohm

(C) Henry

(D) Watt

25. What is the dielectric having relative permittivity of 1.0 ?

(A) Mica

(B) Air

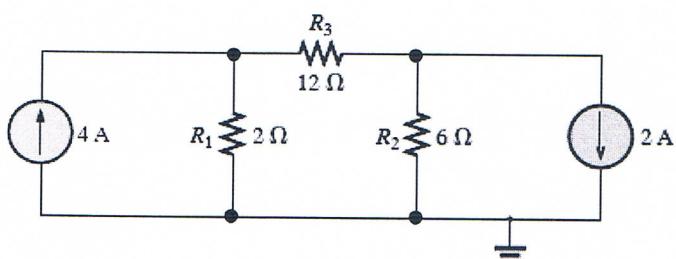
(C) Paper

(D) Vacuum

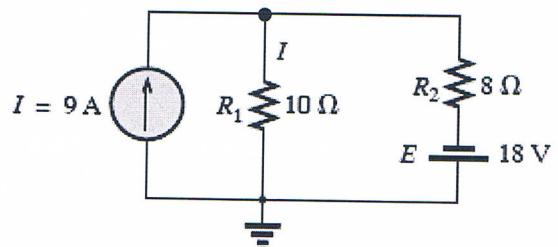
Part 3 (30 points) Calculation

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.

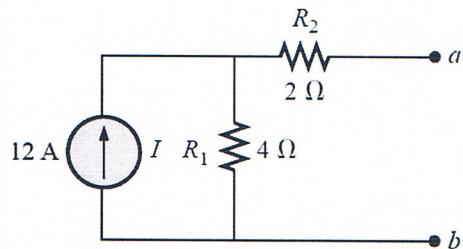


2. Using superposition, find the current I through the 10Ω resistor for each of the networks of figure below.

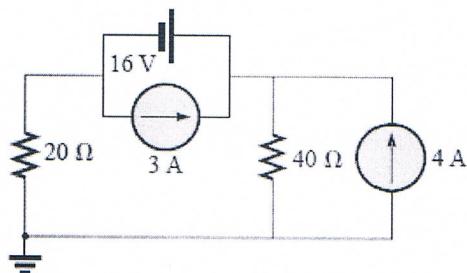


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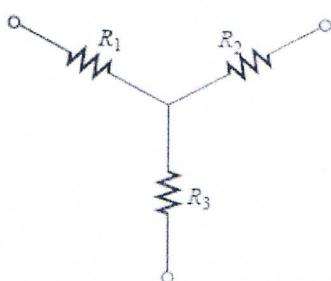
3. Find the Norton equivalent circuit for the network below.



4. Use supernode approach to determine the nodal voltages for the network below



5. Convert the star network below to delta (wye) network where $R_1 = 2 \text{ k}\Omega$, $R_2 = 4 \text{ k}\Omega$, $R_3 = 3 \text{ k}\Omega$.



Answer Sheet

Name: _____ ID: _____

Subject: 341151 Electric Circuits I

Part 1

	True	False
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Part 2

	A	B	C	D
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Asst. Prof. Dr. Poolsak Koseeyaporn,

Asst. Prof. Dr. Titipong Lertwiriyaprappa