College of Industrial Technology

King Mongkut's University of Technology North Bangkok

เลขที่นั่งสอบ

Final Examination of Semester 1 Year: 2019

Subject: 341151 Electric Circuits I Section: 05-06

Date: 17 October 2019 Time: 10.00-12.00

Name:_____ ID:_____ Field of Study:_____

Directions: The test is designed to measure your comprehension. The test is divided into 3 sections. There will be 10 pages (including this page) and they are worth 55 points.

- Answer the questions on this test papers.
- Books, documents and lecture notes are not allowed.
- You must be in the room for one hour after the exam is started and, while taking the exam, you cannot go out except in an emergency case.
- Before leaving, make sure you do not bring this test outside.
- Do not use any electronic communication device.
- Calculators can be used in this test.

Now begin the test.

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).**

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1. When using the superposition theorem, each ideal current source must be replaced by an open circuit.
2. Norton'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, we can experimentally measure the open-circuit voltage across the load terminals E_{Th}.
4. The total capacitance in series and parallel can be found in the same way as conductance 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. At the maximum power, the efficiency is also 100%.
8. Capacitance is a measure of a capacitor's ability to store charge inside the dielectric.
9. The unit of magnetic flux is in webers (Wb) in SI system.
10. Open 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. Convert the current source to a voltage source of circuit in Figure 1.

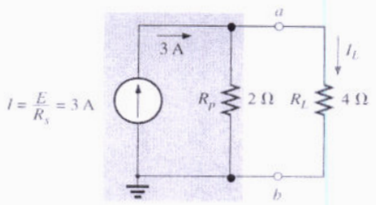


Figure 1.

(A) 12 V and 2 Ω (B) 6 V and 2 Ω (C) 12 V and 4 Ω (D) 6 V and 4 Ω

2. What is the determinant of this matrix?

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

(A) 0 (B) 40 (C) 15 (D) 20

3. Find the value of x in the matrix below.

$$x + 0y - 2z = -1$$
$$0x + 3y + 1z = 2$$
$$1x + 2y + 3z = 0$$

(A) x=-15/13 (B) x=15/13 (C) x=9/13 (D) x=25/13

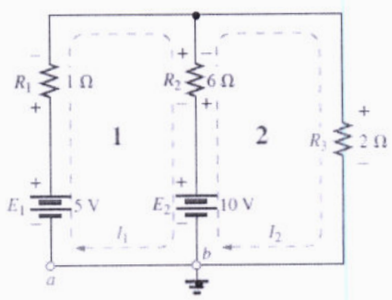


Figure 2.

4. See Figure 2. At mesh #1, which of the following terms describes the voltage across the 6 Ω resistor when using the mesh analysis?

   (A) $(6\ \Omega)(I_2 + I_1)$ (B) $(6\ \Omega)(I_2 - I_1)$ (C) $(6\ \Omega)(I_1 + I_2)$ (D) $(6\ \Omega)(I_1 - I_2)$

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

   (A) $-7I_1+6I_2=5$ (B) $-7I_1+6I_2=10$ (C) $6I_1-8I_2=-10$ (D) $6I_1-8I_2=5$

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

   (A) $-7I_1+6I_2=5$ (B) $-7I_1+6I_2=10$ (C) $6I_1-8I_2=-10$ (D) $6I_1-8I_2=5$

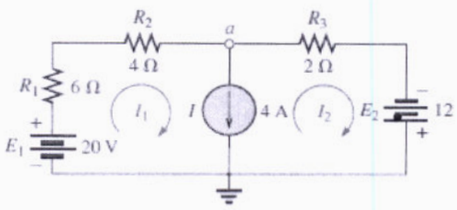
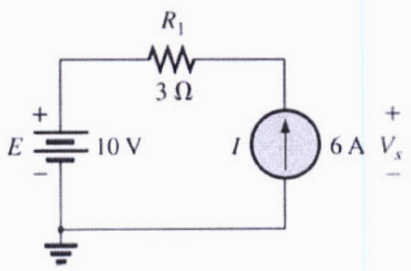


Figure 3.

7. From Figure 3, what is the KVL equation of the supermesh?

   (A) $10I_1+12I_2=32$ (B) $10I_1+2I_2=32$ (C) $2I_1+2I_2=32$ (D) $10I_1+20I_2=32$

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



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

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

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

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

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

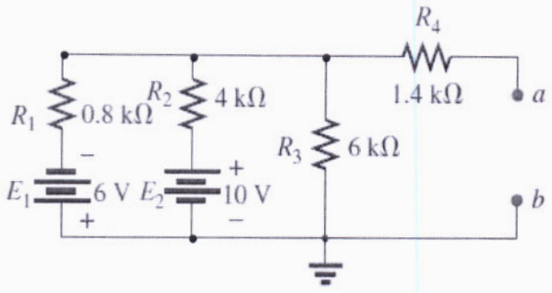
(A) a voltage source and a series resistor.

(B) a current source and a series resistor.

(C) a current source and a parallel resistor.

(D) a voltage source and a parallel resistor.

12. Find the R_{TH} of the figure below.



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

13. 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.

14. 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

15. 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

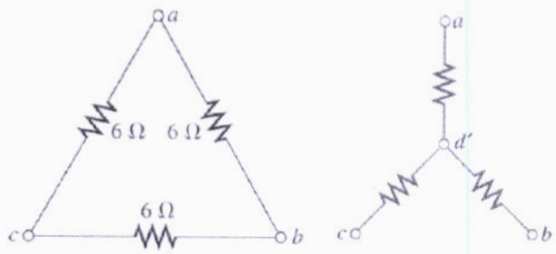
16. What is the total inductor for two series inductors of 2 H and 2 H ?

(A) 1 H (B) 2 H (C) 4 H (D) 6 H

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

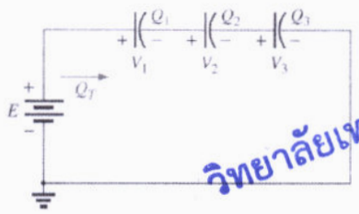
(A) Farad (B) Hertz (C) Henry (D) Weber

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



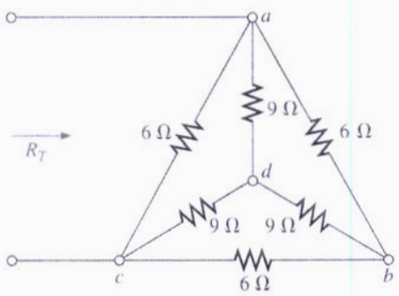
(A) all in 1 Ω (B) all in 2 Ω (C) all in 3 Ω (D) all in 6 Ω

19. What is the correct property from the circuit below ?



(A) $Q_1 = Q_2 = Q_3$ (B) $V_1 = V_2 = V_3$ (C) $E = Q_1 / V_1$ (D) $E = Q_T C_T$

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

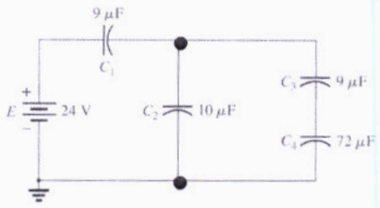


(A) 3.27 Ω (B) 6.7 Ω (C) 4 Ω (D) 6 Ω

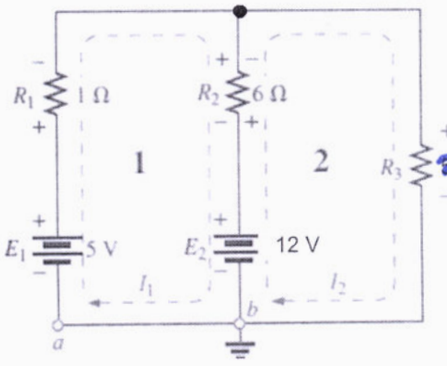
Part 3 (25 points) Calculation

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

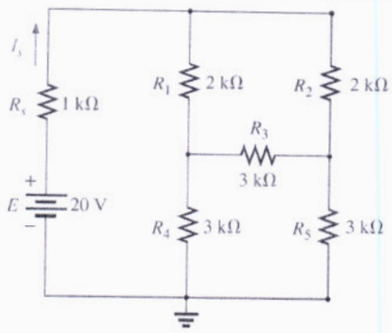
1. (5 points) For the network in below, determine the voltage across capacitor C_4



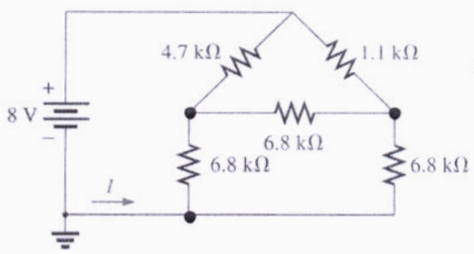
2. (5 points) Determine the current I_1, I_2 and I_{R2} by using mesh analysis method.



3. (5 points) Use Δ to Y of 3 kΩ resistors in the network below and find the current I_s.



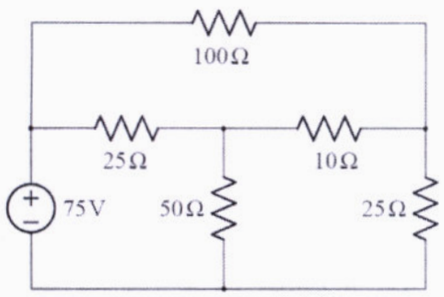
4. (5 points) Convert the Δ of 6.8 kΩ resistors in network below to a Y configuration and find the current I.



5. (5 points)

(a) Find the Thevenin equivalent circuit at resistance R=10Ω.

(b) Determine the voltage of R=10Ω by using Thevenin method.



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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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