College of Industrial Technology

King Mongkut's University of Technology North Bangkok

Final Examination of Semester 1   Year: 2017

Subject: 341151 Electric Circuits I   Section: 05-06

Date: 7 December 2017   Time: 10.00-12.00

Name:_____ID:_____Field of Study:_____

Instructions:

1. The examination has 10 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. Calculators 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. Capacitance is inversely proportional to the distance between the plates and inversely proportional to the area of the plates.

2. The total capacitance of several capacitors connected in series equals the sum of the individual capacitances.

3. The unit of inductor is named after Joseph Henry.

4. Direction of magnetic flux line around conductor with current flow can be determined by right hand rule.

5. Supermesh occurs if there is current source in branch.

6. For nodal analysis, Kirchhoff's current law is used.

7. Norton's equivalent circuit has a current source connected in series with a resistor.

8. An ideal current source has infinite internal resistance.

9. The voltage supplied by an ideal current source is depended on the load.

10. When using the superposition theorem, each ideal voltage source must be replaced by a open circuit.

Part 2 (20 points) Multiple choices

Instruction: Mark the correct answer for the following questions in THE PROVIDED ANSWER SHEET.
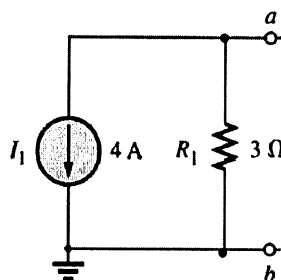
1. Convert the current source to a voltage source.

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

2. What is the determinant of this matrix?

$$\begin{bmatrix} 20 & -4 \\ 5 & 1 \end{bmatrix}$$
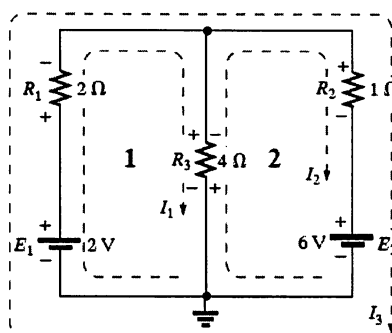
(A) 0   (B) 40   (C) -40   (D) 20

Figure 2.

3. 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 Ω) ($I_2 + I_1$)   (B) (4 Ω) ($I_2 - I_1$)   (C) (4 Ω) ($I_1 + I_2$)   (D) (4 Ω) ($I_1 - I_2$)

4. 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) $6 - I_2 + 4 (I_2 - I_1)=0$

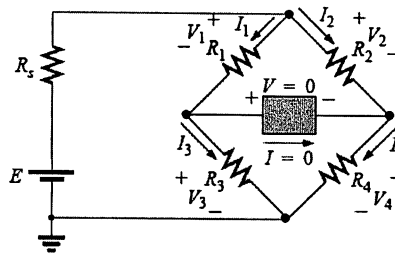
Figure 3.

5. 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) $R_1 R_3 = R_2 R_4$

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

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

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

8. 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.

9. 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.

10. 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

11. 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

12. 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

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

(A) Farad   (B) Hertz   (C) Henry   (D) Weber
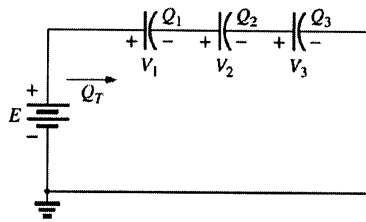
14. What is the symbol of tapped variable inductor ?

(A)   (B)   (C)   (D)
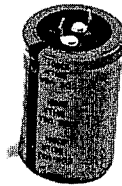
15. What are the values of resistors after converting the delta to star ?

(A) all in 1 Ω   (B) all in 2 Ω   (C) all in 3 Ω   (D) all in 6 Ω
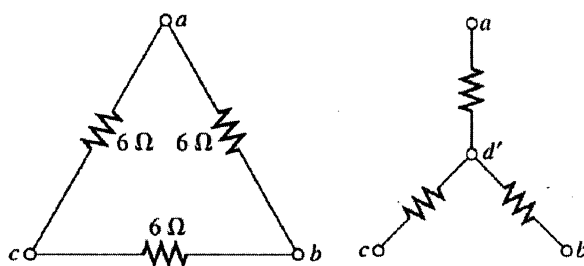
16. What is the correct property from the circuit below ?

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

17. What is the type of capacitor below ?

(A) Polyester   (B) Electrolytic   (C) Tantalum   (D) Surface mount

18. What is the result of x from following two equations?
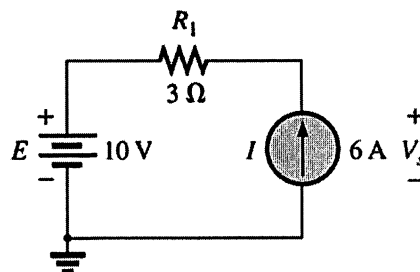
$$-x + 2y = 3$$
$$3x - 2y = -2$$

(A) –2   (B) 0.5   (C) 1   (D) 2

19. 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
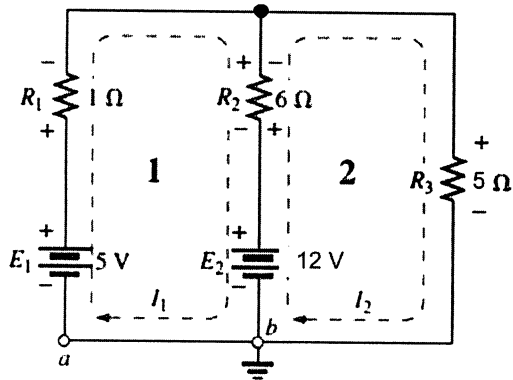
20. Find the value of voltage V_s from the figure below.

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

Part 3 (30 points) Calculation

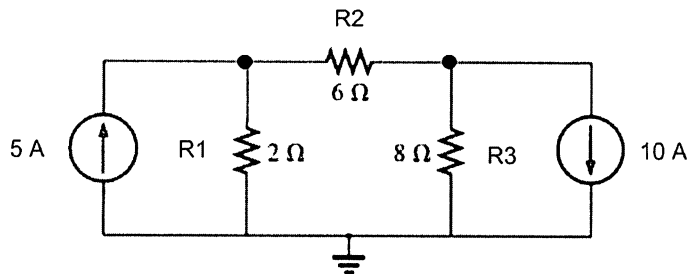Instruction: Show the mathematical expression and answers of following problems.

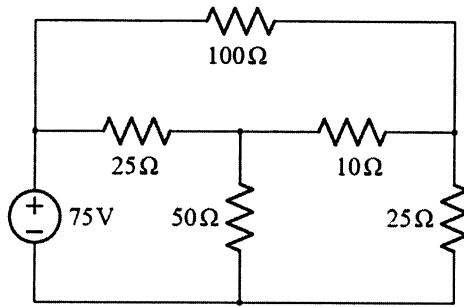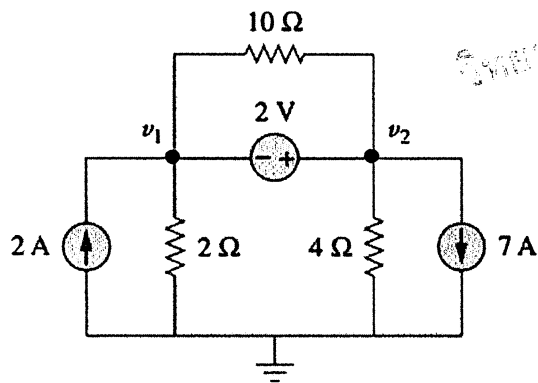1. (5 points) Determine the current I_1, I_2 and I_{R2} by using mesh analysis method.

2. (5 points) Determine the current I_{R1}, I_{R2} and I_{R3} by using supper mesh analysis method.

3. (5 points) Determine the voltage of R=100Ω, R=50Ω and R=25Ω by using node analysis method.

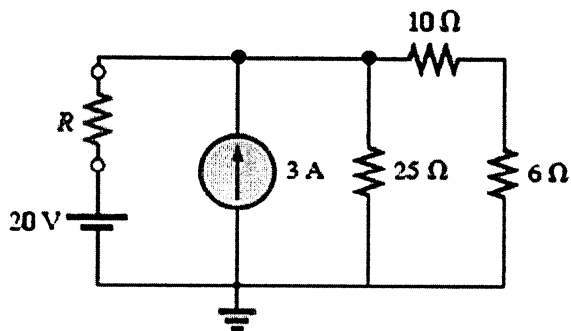4. (5 points) Determine the voltage of R=10Ω, R=4Ω and R=2Ω by using super node analysis method.

5. (10 points)

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

(b) Find optimum load ($R_{optimum}$) and find the maximum power delivered to the optimum load ($R_{optimum}$)

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Answer Sheet

Name: _____ ID: _____

Subject: 341151 Electric Circuits I

Part 1

	True	False
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Part 2

	A	B	C	D
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