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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016**

COURSE NAME : ELECTRIC CIRCUIT ANALYSIS I
COURSE CODE : BEF 12403
PROGRAMME : BACHELOR OF ELECTRICAL
ENGINEERING WITH HONOURS
EXAMINATION DATE : DECEMBER 2015 / JANUARY 2016
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

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Q1 (a) Define and draw the symbol of independent and dependent source. (6 marks)

(b) If the current flowing through an element is given by:

$$i(t) = \left\{ \begin{array}{lll} 3tA, & 0 & \leq t < 6s \\ 18A, & 6 & \leq t < 10s \\ -12A, & 10 & \leq t < 15s \\ 0, & t & \geq 15s \end{array} \right\}$$

Plot the charge stored in the element over $0 < t < 20s$. (10 marks)

(c) The voltage, v across a device and the current, i through it are:

$$v(t) = 10 \cos 2t \text{ V}, \quad i(t) = 20 (1 - e^{-0.5t}) \text{ mA}$$

Determine:

(a) The total charge in the device at $t = 1s$ (2 marks)

(b) The power consumed by the device at $t = 1s$ (2 marks)

Q2 (a) Define and state the mathematical equation of Ohm's Law. (3 marks)

(b) Show that the current I_2 in the circuit of **Figure Q2(b)** is given by:

$$I_2 = \frac{R_1 I}{R_1 + R_2} \quad (5 \text{ marks})$$

(c) Refer to the circuit shown in **Figure Q2(c)**, calculate the total resistance, R_{ab} seen from terminal a-b and the voltage, V_{ab} across terminal a-b. (12 marks)

Q3 (a) State the definition of "supernode" used in the nodal analysis. (2 marks)

(b) Consider the circuit shown in **Figure Q3(b)**, calculate V_1 , V_2 , V_3 , and V_4 in the circuit using nodal analysis. (12 marks)

- (c) Obtain the actual value of V_0 for the circuit in **Figure Q3(c)**. Use linearity property by assuming that $V_0 = 1\text{ V}$.
(6 marks)

- Q4** (a) Summarize **three (3)** general procedures of mesh analysis and highlight the fundamental law involve.
(4 marks)

- (b) Evaluate the mesh currents i_1 and i_2 of the circuit in **Figure Q4(b)** using Cramer's rule technique.
(9 marks)

- (c) Considering superposition theorem, find v_0 in the circuit of **Figure Q4(c)**.
(7 marks)

- Q5** (a) Describe the term of '*maximum power transfer*'.
(2 marks)

- (b) Determine i_0 in the circuit of **Figure Q5(b)** using source transformation.
(10 marks)

- (c) Referring to the circuit in **Figure Q5(c)**, suggest the Thevenin equivalent at terminals $a-b$.
(8 marks)

– END OF QUESTIONS –

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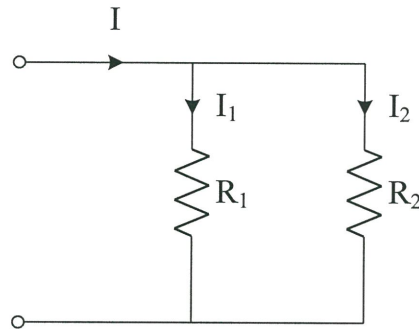


FIGURE Q2(b)

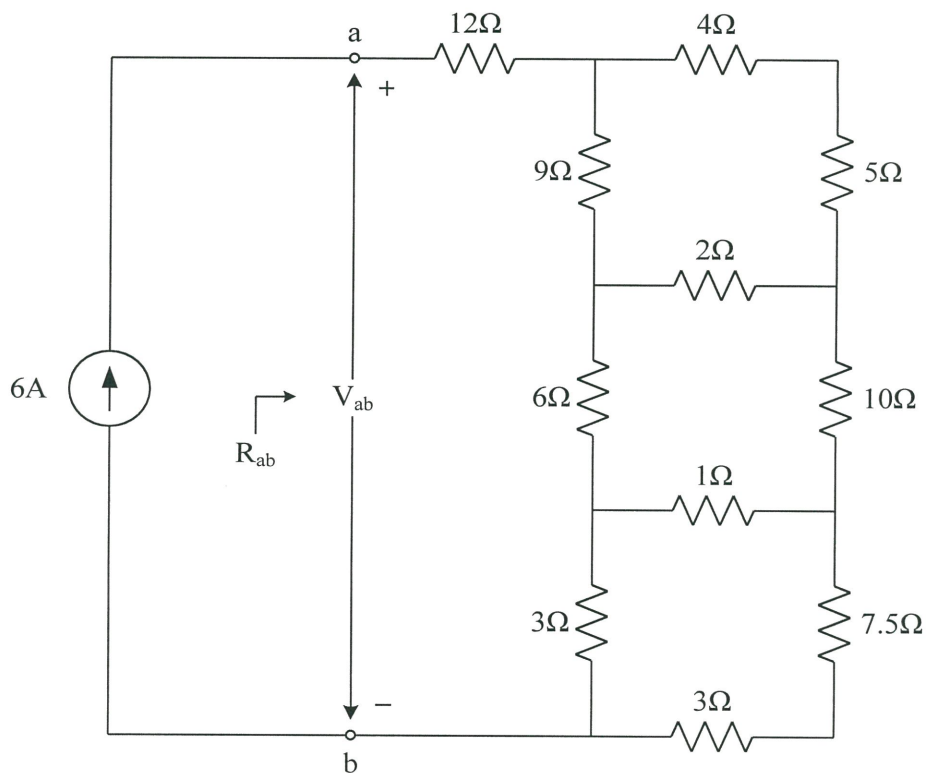


FIGURE Q2(c)

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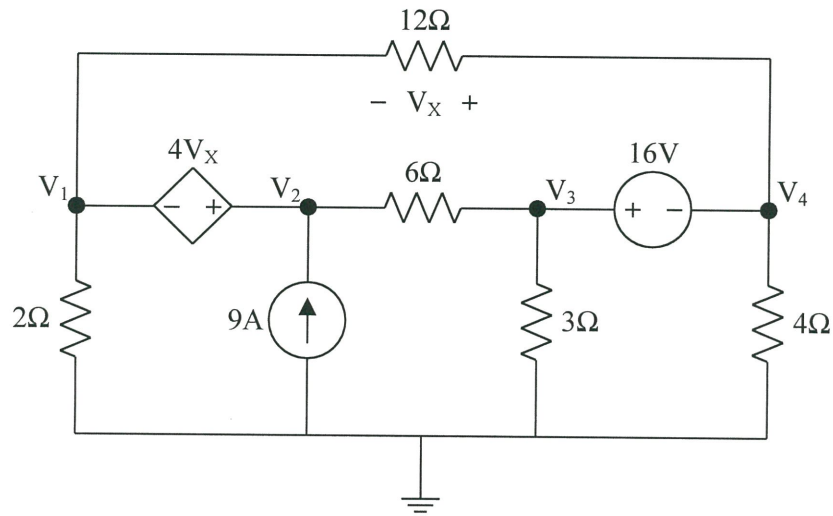


FIGURE Q3(b)

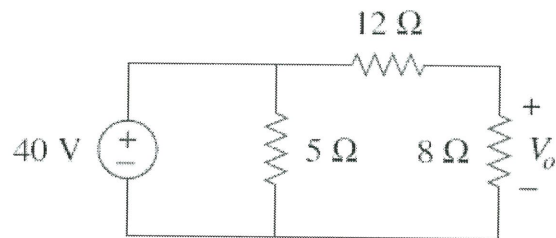


FIGURE Q3(c)

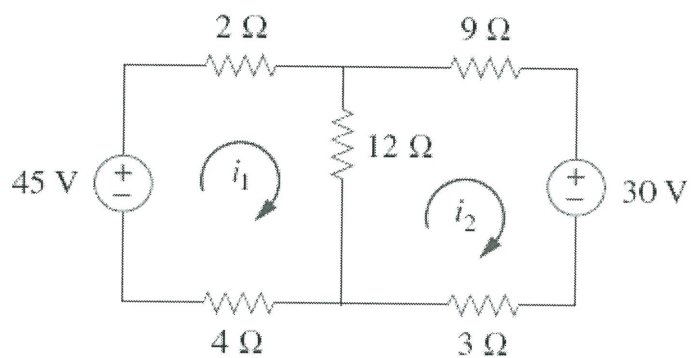


FIGURE Q4(b)

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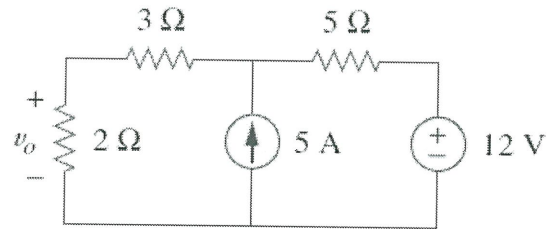


FIGURE Q4(c)

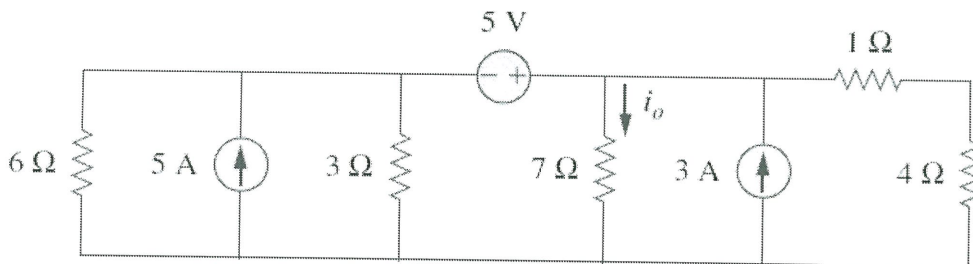


FIGURE Q5(b)

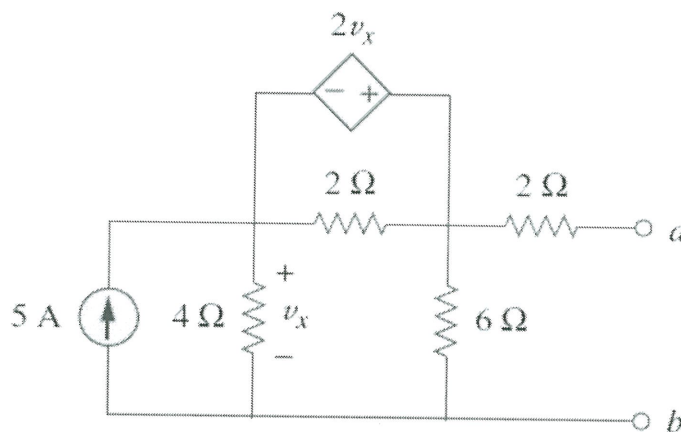


FIGURE Q5(c)