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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : ELECTRIC CIRCUIT ANALYSIS I
COURSE CODE : BEF 12403
PROGRAMME CODE : BEV
EXAMINATION DATE : JUNE / JULY 2016
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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- Q1** (a) Define '*dependent source*' and list **four (4)** possible types of dependent sources in circuit element. (6 marks)
- (b) Current flows in a wire is shown in **Figure Q1(b)**.
- (i) Sketch the corresponding charge in the wire. (4 marks)
- (ii) Calculate the total charge $q(t)$ transferred over the time interval of $0s \leq t \leq 2s$. (2 marks)
- (c) Prove the total effective power absorbed and supplied by each element for the circuit in **Figure Q1(c)** is zero. (8 marks)
- Q2** (a) With the help of an appropriate circuit representation, illustrate and describe the terms of branch, node and loop. (6 marks)
- (b) By converting Wye into Delta representation, shows that the total equivalent resistance is 24Ω for the circuit shown in **Figure Q2(b)**. Hence, determine the current, I_o . (8 marks)
- (c) **Figure Q2(c)** shows a 60 Watt light bulb rated at 120 volts. Predict the voltage, V_s to make the light bulb operate at the rated conditions. (6 marks)
- Q3** (a) Summarise **three (3)** general procedures for nodal analysis. Highlight the fundamental law involved. (6 marks)
- (b) By using nodal analysis, determine the voltage, v_o for the circuit shown in **Figure Q3(b)**. (6 marks)

- (c) By applying the concept of supernode, determine the voltage of v_1 , v_2 , v_3 for the circuit given in **Figure 3(c)**. (8 marks)

- Q4** (a) With the help of an appropriate circuit representation, describe the term of supermesh. (3 marks)

- (b) Considering a circuit given in **Figure Q4(b)**,

- (i) Show that i_1 , i_2 , and i_3 can be expressed in matrix form as given below.

$$\begin{bmatrix} 11 & -5 & -6 \\ -5 & 19 & -2 \\ -1 & -1 & 2 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 12 \\ 0 \\ 0 \end{bmatrix}$$

(8 marks)

- (ii) Determine the current, i_0 by using the Cramer's rule technique.

(7 marks)

- (c) Justify the choice of using mesh current instead of mesh element as a variable in circuit analysis. (2 marks)

- Q5** (a) Referring to the circuit given in **Figure Q5(a)**, determine the Thevenin equivalent at terminals a and b . (8 marks)

- (b) With the help of relevant graph representation i.e. plot of $P_{delivered}$ against R_{load} , describe 'maximum power transfer'. (4 marks)

- (c) Determine the maximum power transfer delivered to R_L for the circuit shown in **Figure Q5(c)**. (8 marks)

– END OF QUESTIONS –

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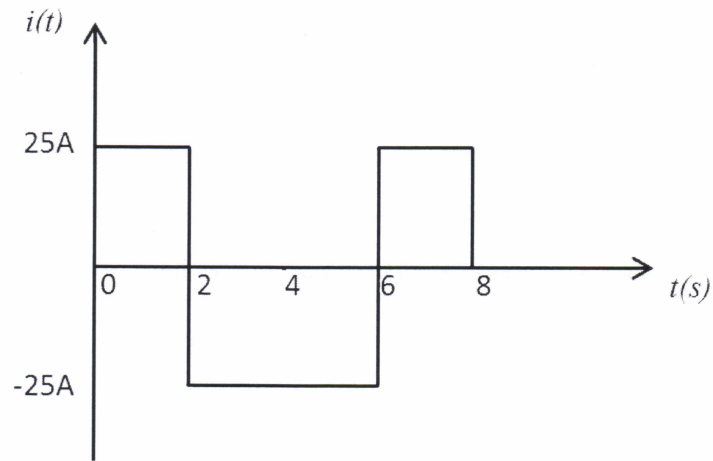


FIGURE Q1(b)

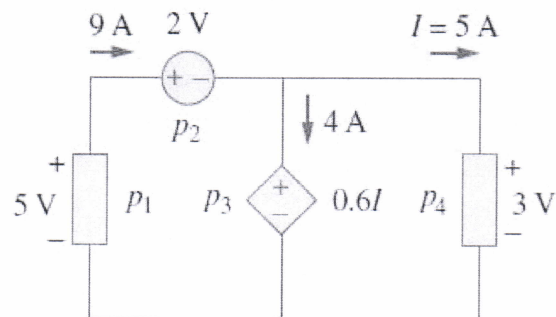


FIGURE Q1(c)

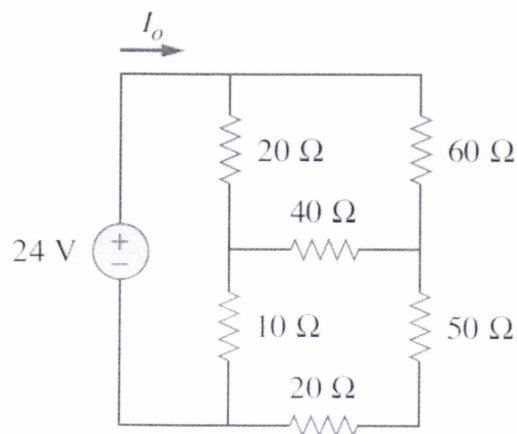


FIGURE Q2(b)

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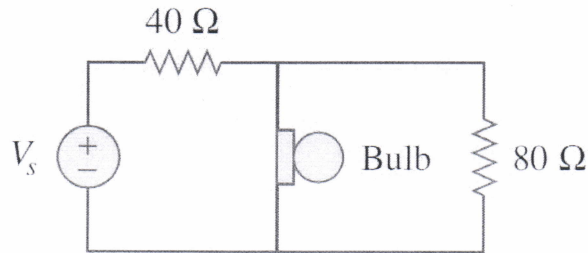


Figure Q2(c)

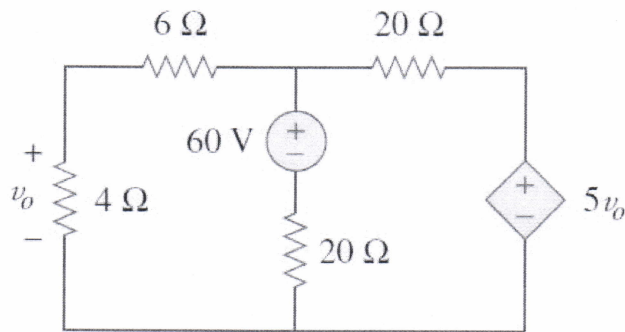


Figure Q3(b)

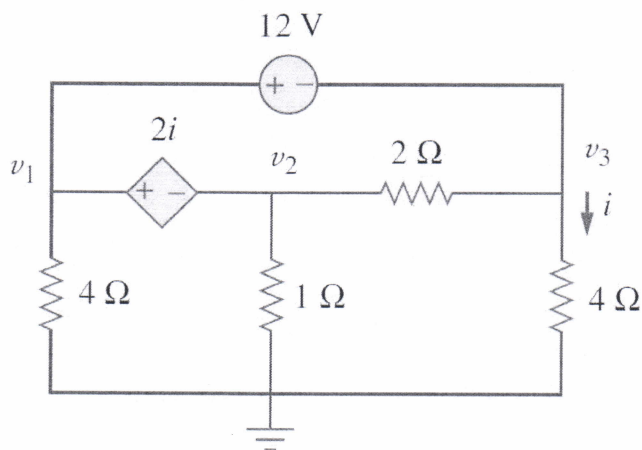


Figure Q3(c)

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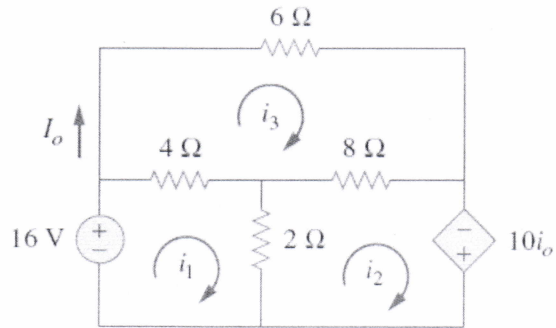


Figure Q4(b)

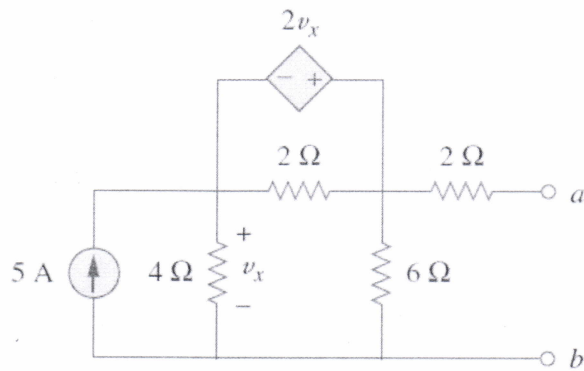


Figure Q5(a)

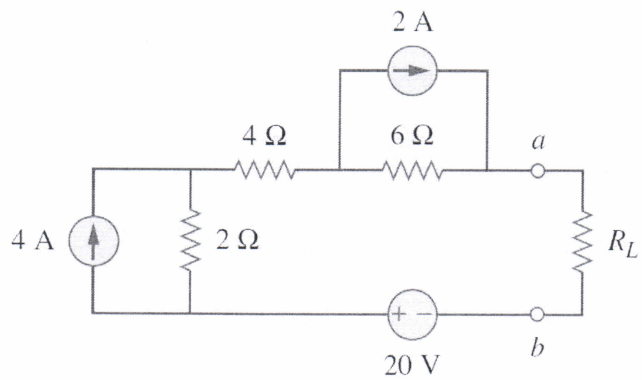


Figure Q5(c)