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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME	:	ELECTRICAL PRINCIPLES I
COURSE CODE	:	DAR 11003
PROGRAMME	:	1 DAR
EXAMINATION DATE	:	DECEMBER 2015/ JANUARY 2016
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE(5)** QUESTIONS ONLY

THIS PAPER CONSISTS OF **TWELVE (12)** PAGES

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Q1 For the circuit of **Figure Q1**:

(a) Find the total resistance R_T. (3 marks)

(b) Find the source current I_S. (2 marks)

(c) Find the currents I_2, I_3 and I_5. (9 marks)

(d) Find the voltages V_2 and V_4. (6 marks)

Q2 (a) For the circuit of **Figure Q2(a)**, determine the current through each resistor using mesh analysis.

(10 marks)

(b) For the circuit of **Figure Q2(b)**, determine the magnitude and polarity of the voltage across each resistor using nodal analysis.

(10 marks)

Q3 (a) Using superposition, find the voltage V_2 for the network in **Figure Q3(a)**.

(10 marks)

(b) Determine the Thévenin equivalent circuit for the networks of **Figure Q3(b)** external to the resistor R.

(10 marks)

Q4 (a) For the network in **Figure Q4(a)**:

(i) Determine the value of resistor R for maximum power to R.

(4 marks)

(ii) Determine the maximum power to resistor R.

(8 marks)

(b) Determine the Norton equivalent circuit for the networks of **Figure Q4(b)** external to the resistor R.

(8 marks)

Q5 (a) For the series circuit of **Figure Q5(a)**:

(i) Determine the mathematical expressions for inductor current i_L and voltage v_L following the closing of the switch.

(8 marks)

(ii) Determine inductor current i_L and voltage v_L after one time constant.

(4 marks)

(b) Find the necessary current to establish a flux of 3×10^{-4} Wb in the series magnetic circuit in **Figure Q5(b)**. Please refer to **Figure Q5(c)** and **Figure Q5(d)** for normal magnetization curve.

(8 marks)

Q6 (a) For the circuit of **Figure Q6(a)**:

(i) Find the time required for capacitor voltage v_c to reach 60 V following the closing of the switch.

(8 marks)

(ii) Calculate the capacitor current i_C at the instant capacitor voltage $v_c = 60$ V.

(6 marks)

(b) Find the sinusoidal expression for the applied voltage e_{in} for the system of **Figure Q6(b)** if

$V_a = 60 \sin(\omega t + 30°)$
$V_b = 30 \sin(\omega t - 30°)$
$V_c = 40 \sin(\omega t + 120°)$

(6 marks)

Q7 Write the analytical expression for the waveforms of **Figure Q7** with the phase angle in degrees.

(20 marks)

- END OF QUESTION -

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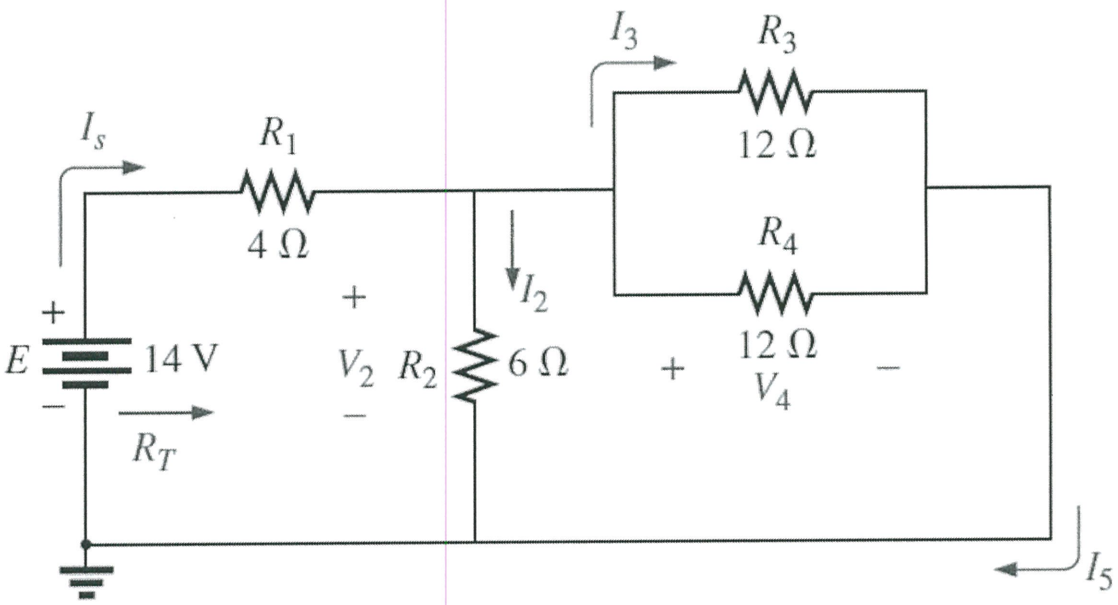

FIGURE Q1

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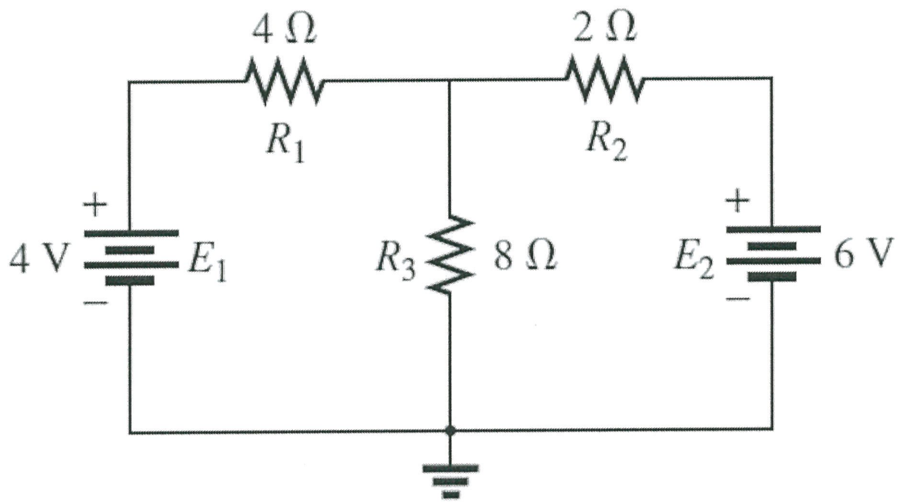

FIGURE Q2(a)

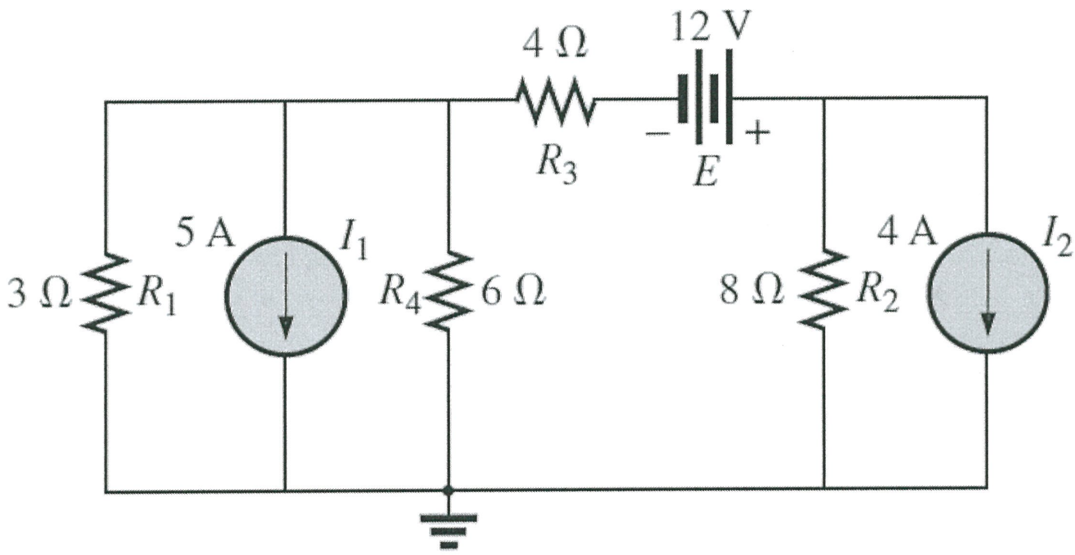

FIGURE Q2(b)

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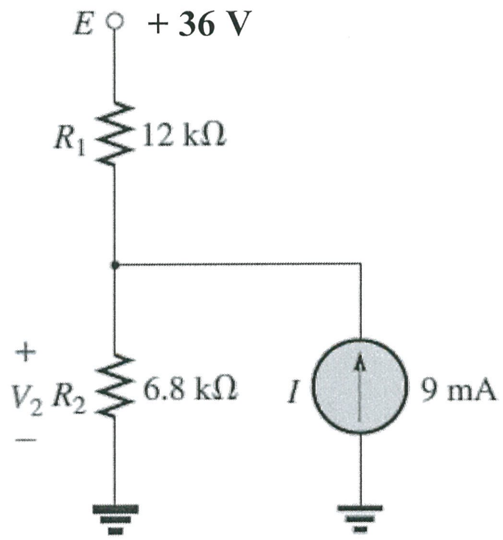

FIGURE Q3(a)

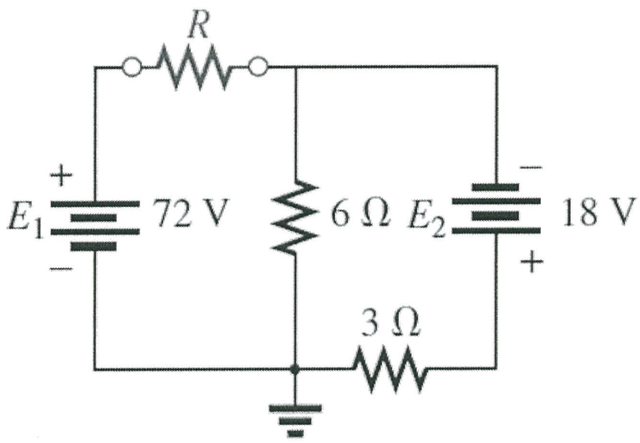

FIGURE Q3(b)

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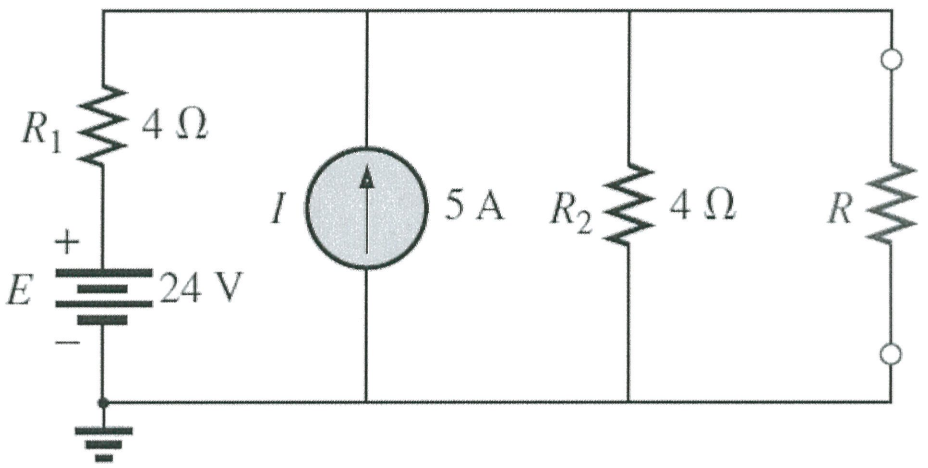

FIGURE Q4(a)

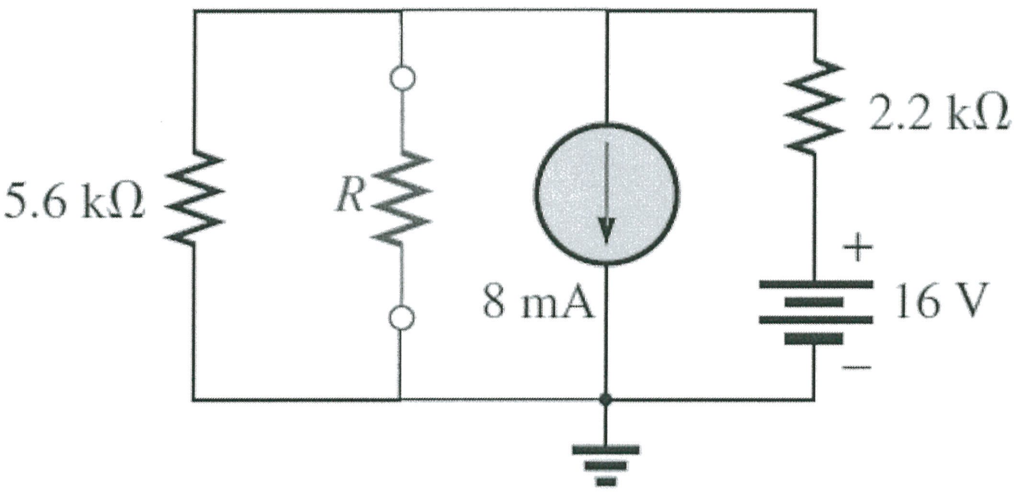

FIGURE Q4(b)

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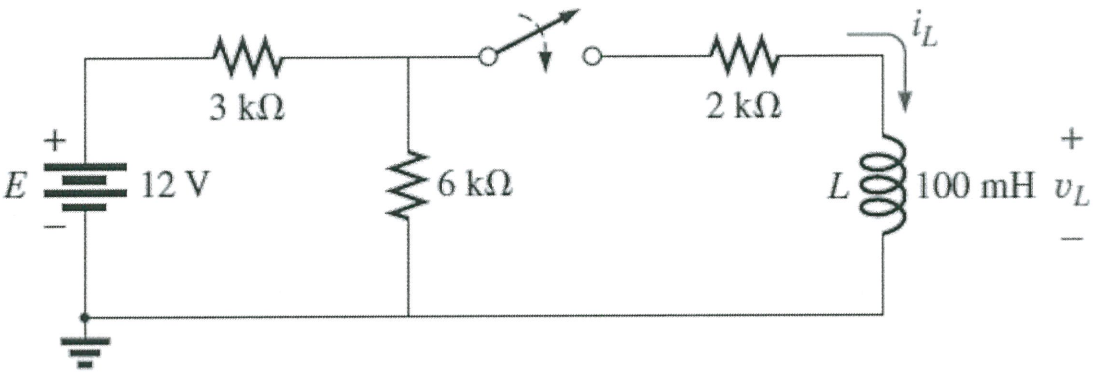
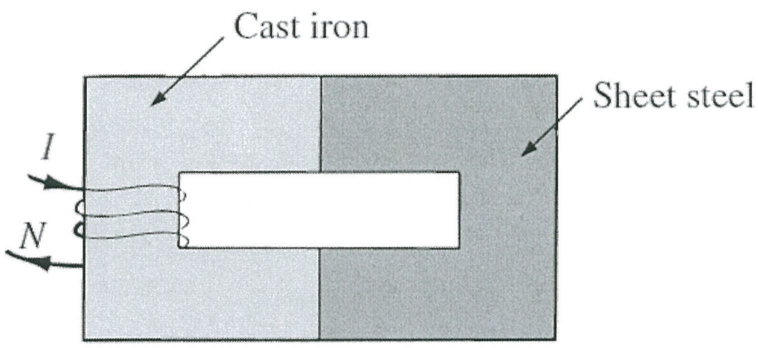


FIGURE Q5(a)



$l_{\text{iron core}} = l_{\text{steel core}} = 0.3$ m
Area (throughout) $= 5 \times 10^{-4}$ m^2
$N = 100$ turns

FIGURE Q5(b)

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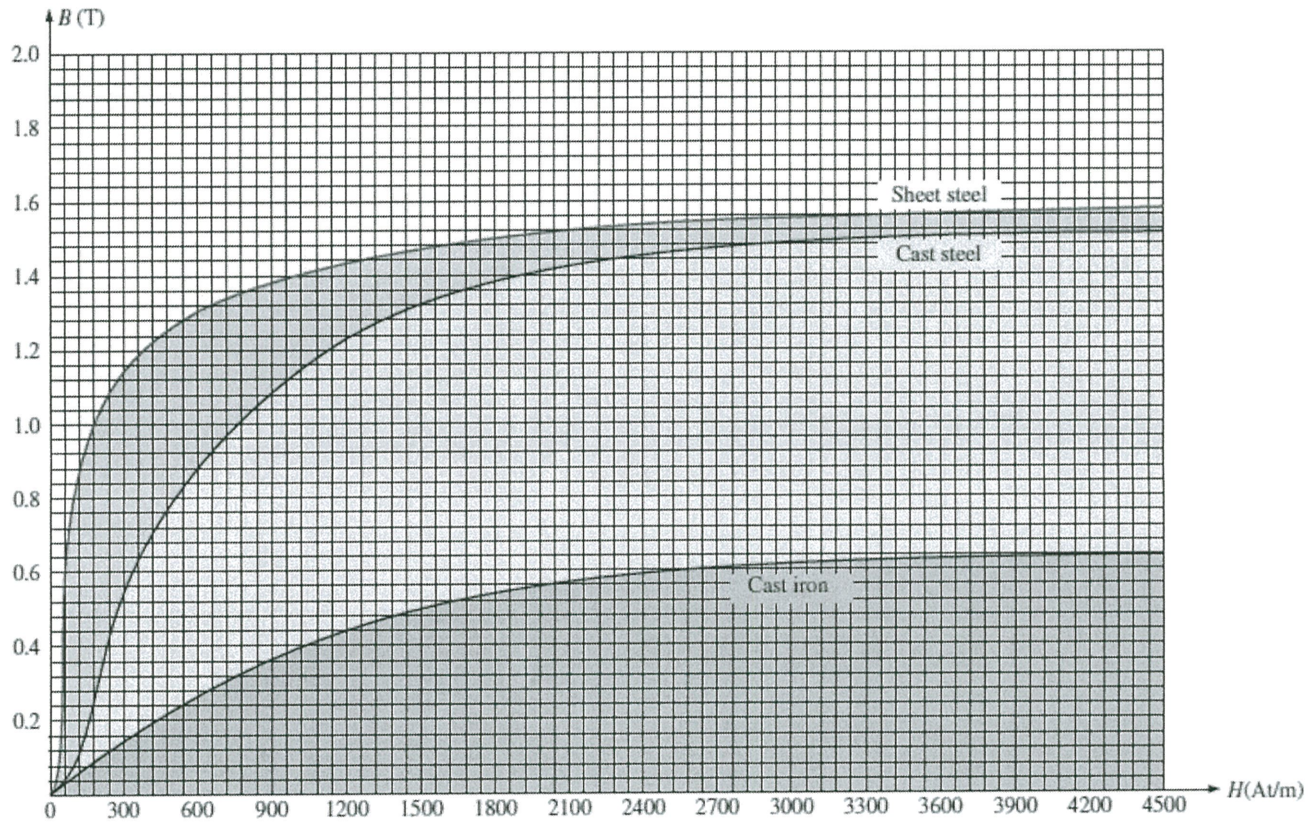

FIGURE Q5(c)

Normal magnetization curve for three ferromagnetic materials.

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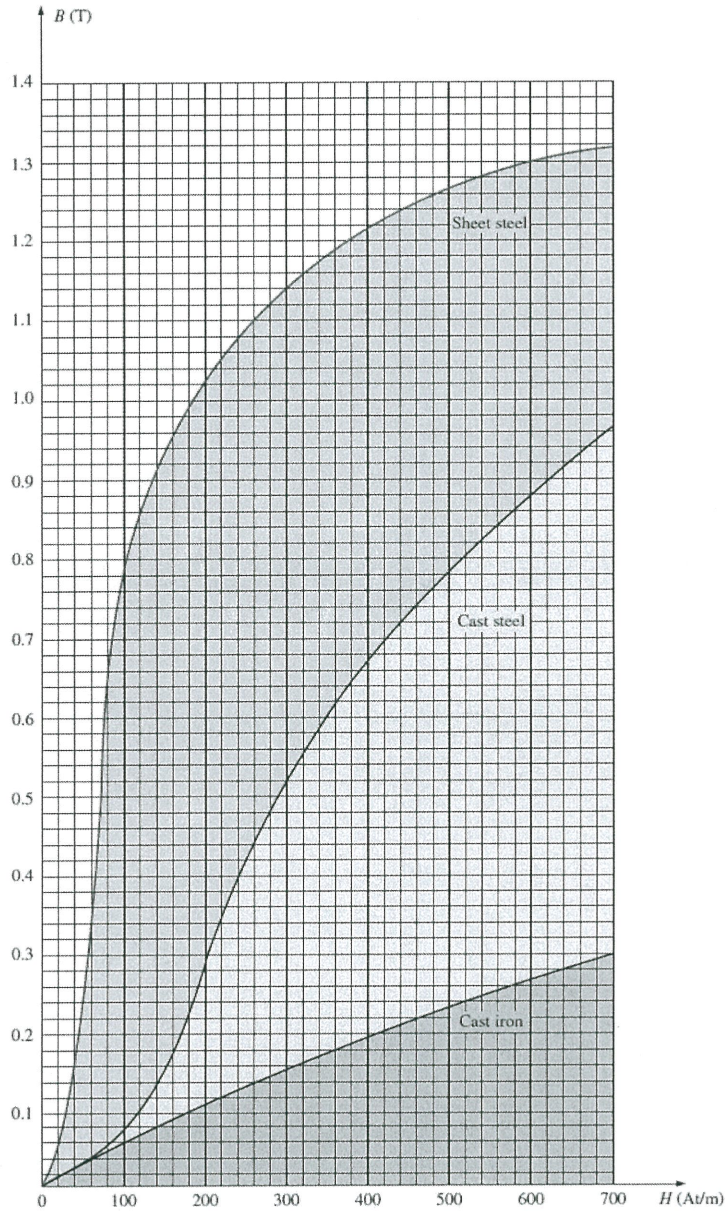

FIGURE Q5(d)

Expanded view of Figure Q5(c) for the low magnetizing force region.

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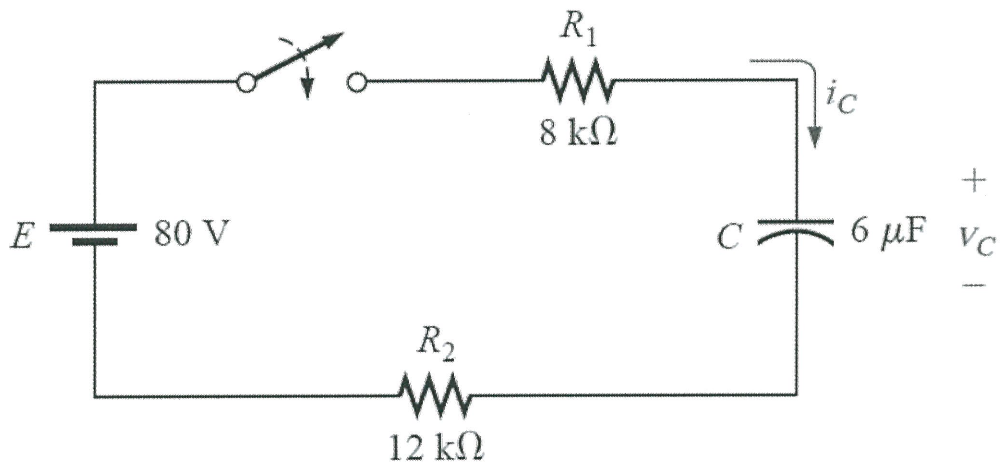

FIGURE Q6(a)

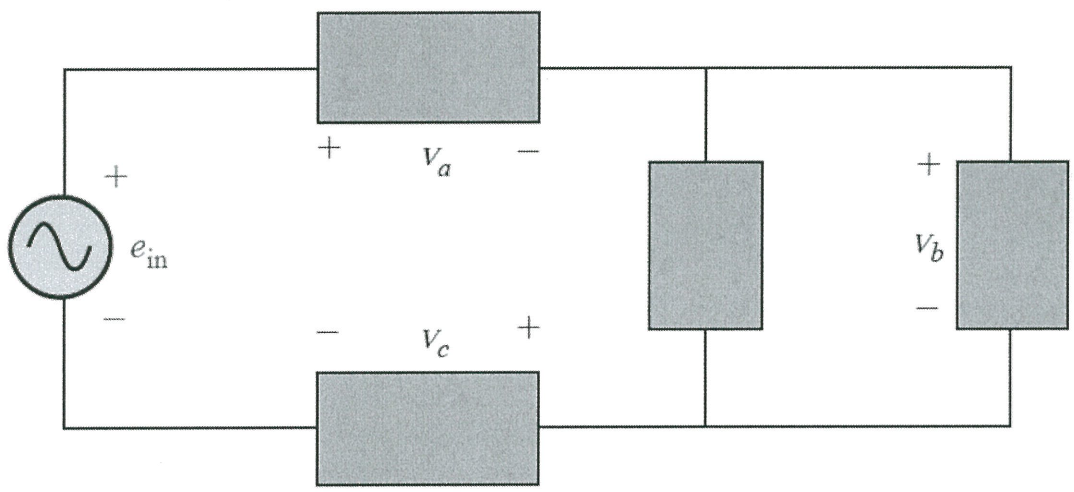

FIGURE 6(b)

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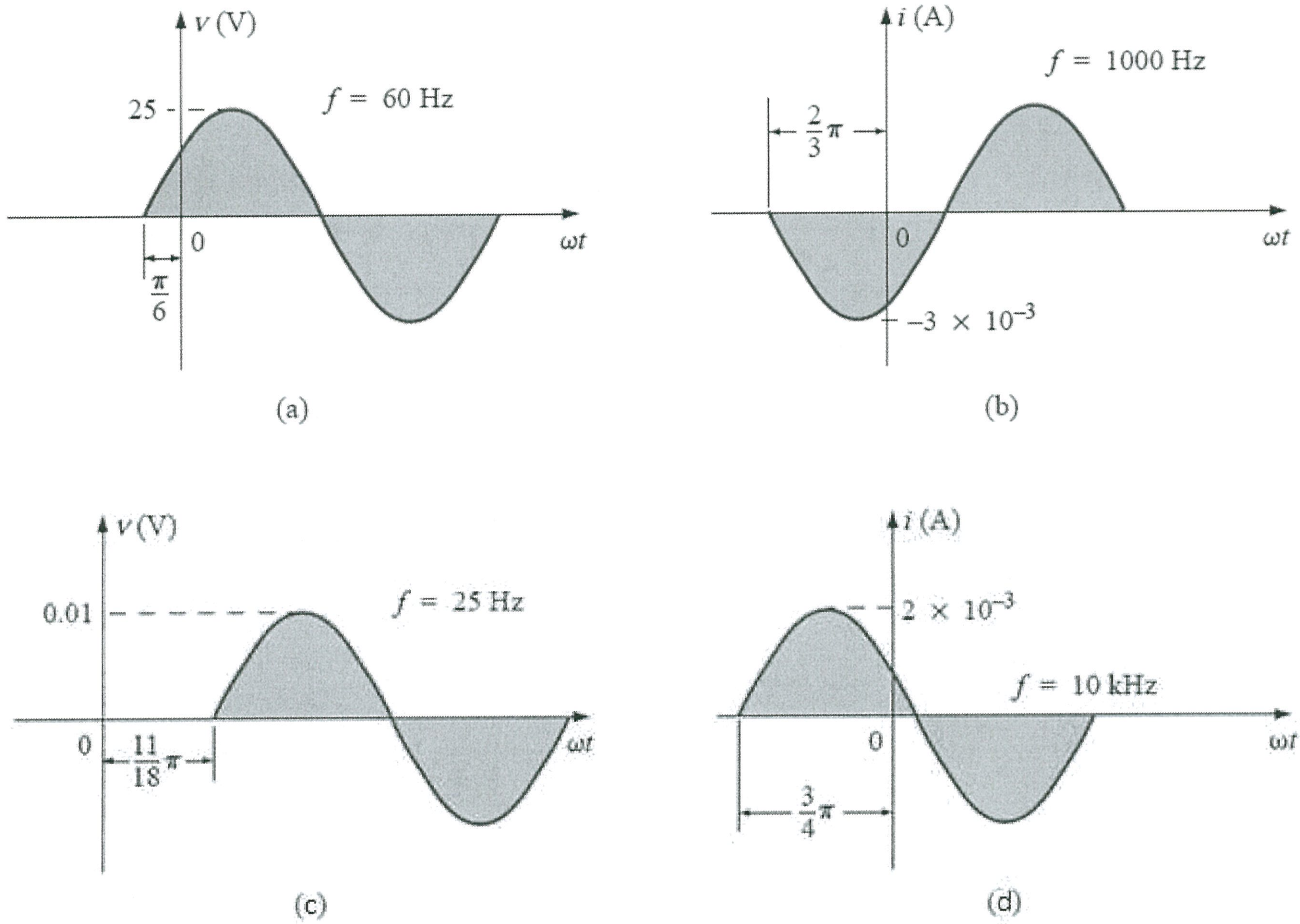

FIGURE Q7